SCIENTIFIC AMERICAN

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THE NEW TWIN STEAMER "CALAIS-DOUVRES."

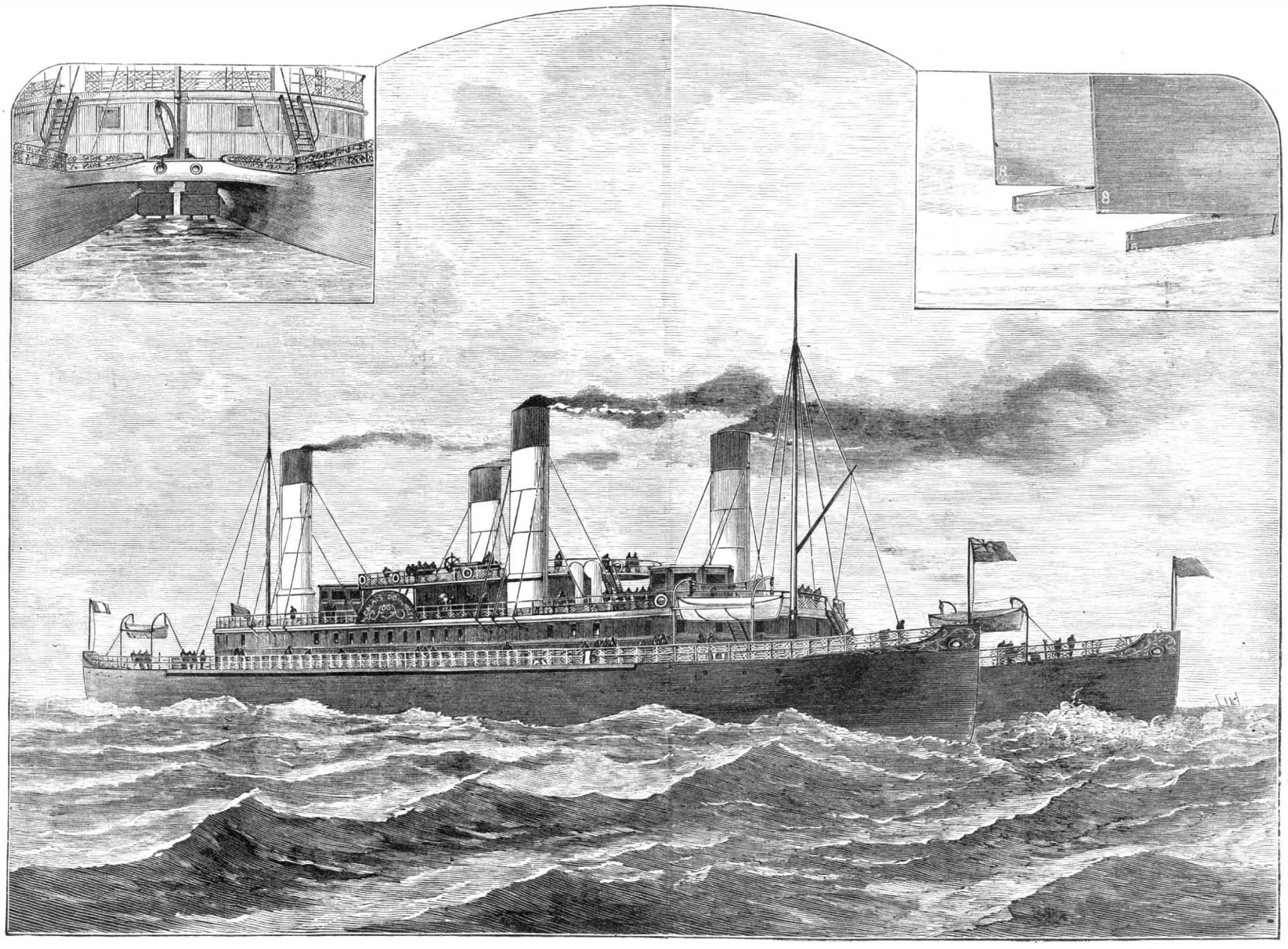
Our engraving, which we take from the London *Illustrated News*, represents the new channel steamer, the Calais-Douvres, a double boat contrived somewhat differently from the Castalia, to prevent sea sickness in the passage between Dover and Calais. The designer and builder of the Calais-Douvres, Mr. Andrew Leslie, of Hebburn-on-Tyne, instead of joining together two half ships, as in the Castalia, has given to each twin part the form of a perfect ship. Through the wider space thus left between the stems of the sister vessels the water rushes with the velocity of a mill race, giving the paddle wheels, which are placed amidships and between the twin ships, a "bite" that never fails while the vessel is in motion, and as the water escapes through the widening space at the stern it tends to propel her by the expansive force of the pent-in current. As the ship has to carry the French mails, speed is an important matter so far as the company owning her are concerned, and in this respect she has answered the expectations that had been formed of her capabilities, making the trip across from pier head to pier head, a distance of twenty-five miles, in an hour and a half. With a high rate of speed and the minimum amount of rolling and pitching and tossing yet attained, the new ship further offers a maximum of comfort.

The spacious saloons, handsomely fitted up, are all above deck, so that free ventilation is secured, and there are also comfortable compartments or smaller cabins, which will be let either in separate numbered seats or to be used as private rooms by families. A few figures will show the superiority of the new vessel to the old channel boats in point of size. She is 300 feet in length and has a breadth of 60 feet, or half as much again as many of the Atlantic steamers; and, what is of not less importance to the regularity of the passage, she draws only about 6 feet of water, so that she can enter the harbor of Calais when the tide is comparatively low. This vessel, indeed, though of 2,000 tons burden, draws one foot of water less than did the Castalia, while her length is 10 feet and her breadth 1 foot greater. The two hulls are each about 1 foot wider than were the Castalia's half hulls, while the channel between them, in which the paddles work, is 2 feet narrower.

The effect of these and other details of construction, as contrasted with the arrangements of the Castalia, is to give a plentiful supply of water to the wheels, thus enabling them to utilize a much larger proportion of power than can be the case with a parallel channel. The two hulls are fixed together by means of four transverse iron girder bulkheads, entirely spanning the channel between the two minor vessels on which the boat proper rests; and it is noteworthy that the vibration resulting from this arrangement is scarcely observable.

The steering apparatus employed is known as Brotherhood's patent. It is said to be so easily workable that one man, by means of a small wheel, can practically do what he pleases with the ship. This vessel is intended to accommodate as many as 1,000 passengers. Her engines, four in number, of 400 horse power, nominally, have the enormous effective force of 4,000 horse power. They were built by Messrs. Black, Hawthorn & Co., of Gateshead-on-Tyne. The ship was originally begun for the English Channel Steamship Company, but when that company was wound up she was purchased by her present owners—the London, Chatham, and Dover Railway Company.

The two smaller illustrations, which accompany our engraving on this subject, need a word of explanation. The first is an end view, looking between the two hulls, showing the position of the paddles, which are placed amidships in the interior space. It will be perceived that there are no exterior paddles, but only those placed between the two hulls. The second of our small engravings represents the pair of rudders at one end of the double ship. The ends, with their respective pairs of rudders, are precisely similar fore and aft, the ship being designed, like some of the Thames steamboats, to move in either direction at pleasure without turning round. For this purpose the two ends are so constructed and so furnished with rudders that either can be made to answer for bows or stern. There is an arrangement by which either pair of rudders can be put out of gear. When the end in question is to be made the forward end of the ship the rudder is closed up to that part of the hull in the line of the keel, and is locked by letting down a pin into the rudder, so as to form a solid end forward. When this end becomes the aft or steering end of the ship, the pin is raised to unlock the rudder, which can then be shifted by the helm to port or starboard, as shown in the illustration.



THE NEW DOUBLE STEAMSHIP CALAIS-DOUVRES.

Industrial Drawing and Art Studies.

The annual exhibition of works from the free industrial classes and public schools of Massachusetts, lately held in Boston, gave evidence not only of increasing popular interest in practical art studies, but also of careful teaching and considerable talent on the part of the pupils of the schools that contributed. The exhibit was principally from the Boston city schools and the Normal Art School. In the former, models in plaster, of architectural details, of original design as well as copies, were present for the first time—a decided and meritorious addition to the range of studies. The exhibit of the Starr King School, both in mechanical and free-hand subjects, displayed the same practical character; and so did that of the newly established class at Roxbury, and the ship draughting classes at East Boston and Charlestown. The Normal Art School exhibit was of unusual interest.

IT is reported that several large diamonds have lately been washed from the gravel at Myrtle Creek, Oregon.

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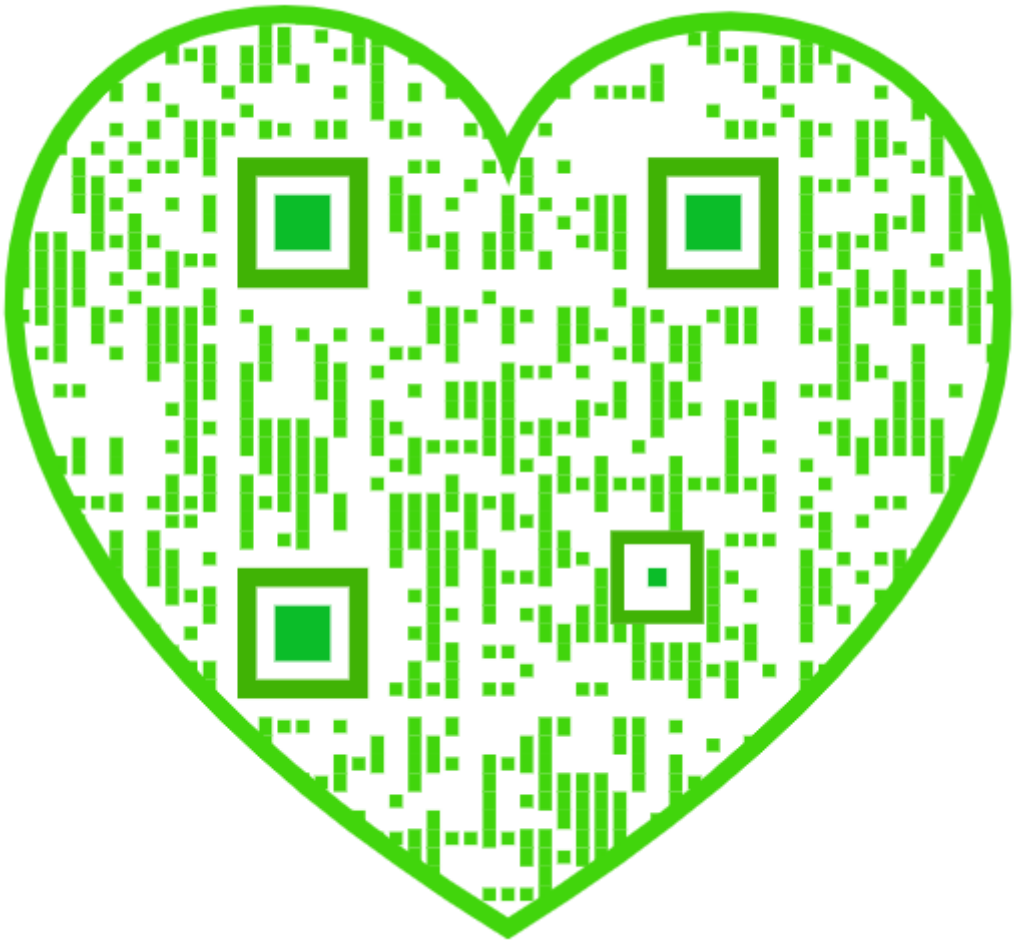

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NEW YORK, SATURDAY, JULY 27, 1878.

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VULCANIZING RUBBER.

In reply to numerous queries from our correspondents, we give the following general information respecting the processes in common use for vulcanizing caoutchouc. The purified and masticated gum is kneaded on warm rolls with the proper proportion of flowers of sulphur. Other substances, as whiting, white lead, litharge, zinc oxide, disintegrated refuse rubber (vulcanized), etc., are often added to increase the volume of the product and economize the more costly caoutchouc. Lead compounds blacken the goods through the formation of lead sulphide.

For soft goods the proportion of sulphur added is usually about six per cent. For the cheaper grades of fabrics a mixture in common use is, rubber 32, sulphur 2, whiting 25, white lead and litharge 4. The product is black, resembling that of which rubber overshoes are made. For lighter fabrics oxide of zinc is sometimes substituted for the lead. After thoroughly kneading the mixture into a homogeneous mass, it is rolled into sheets or boards, and from these the forms are moulded—the substance readily receiving and retaining the impression of a warm mould into which it is forced.

The heating or vulcanizing is conducted in strong cast iron cylinders, one end of which is movable and serves as a door. The goods to be vulcanized are loaded upon a car and run in upon a railway extending along the bottom of the chamber. Powdered steatite (soapstone) is freely used to prevent adhesion of the different articles, the goods often being packed in boxes filled with this substance. When the heater is charged and the door made fast, high pressure steam is admitted until the desired temperature is attained. This varies somewhat with the character of the articles—according to Dr. Chandler, five hours at 240° Fah. is said to be the temperature for fire hose. In factories where smaller articles are made, the goods are generally exposed in the heaters for four to four and one half hours, the temperature, at first about 250°, gradually being augmented to 275° Fah., at the termination of the operation. A temperature exceeding 280° Fah. injures the goods. Hard rubber, vulcanite, or ebonite differs from ordinary vulcanized rubber only in that a much larger proportion of sulphur enters into its composition and the vulcanizing process is conducted at a more elevated temperature. Usually the caoutchouc has incorporated with it half its weight of sulphur; but, as in the preparation of soft rubber, various foreign substances—metallic sulphides and oxides, shellac, asphaltum, etc.—are often added. Mixed with a little litharge it becomes very black; with sulphide of mercury (vermilion), bright red; and composition similar to the red vulcanite used for dental purposes is prepared with six parts of sulphur, sixteen of caoutchouc and eleven or twelve of vermilion. The vulcanizing operation is usually conducted at temperatures increasing from 275° Fah. to 305° Fah., the time required being about six hours. The articles are packed in steatite or supported in water trays in the vulcanizer, and, if to present a glossy exterior, are sometimes enveloped in thick thin foil.

Thin sheets of rubber or small articles are sometimes vulcanized by what is called the cold process (Parks's). In this the caoutchouc is simply immersed in a mixture of forty parts of carbon disulphide or benzolene and one part of sulphur chloride. It is next placed in a room heated to 70° Fah., and when all the carbon sulphide has been volatilized the process is in so far complete that it is only requisite to boil the material in one pound of caustic potash in about 2 gallons of water, the vulcanized caoutchouc being next washed to remove excess of alkali. The results of this treatment are not always satisfactory owing to the superficial action of the vulcanizing substances.

STRAWBERRIES AND CONSTIPATION.

Professor F. H. Storer, of Harvard University, in a communication to the *Journal of Pharmacy*, calls attention to the fact, not generally known (and which certainly would scarcely be expected), that ripe strawberries are very apt to induce constipation. He remarks that in this country particularly, "where an immense and well nigh universal consumption of this fruit is coincident with the setting in of hot weather, the constipating action of the berry is complicated and, as it were, increased by the excessive waste of water from the body, by perspiration, which occurs at this period; and there can be little doubt that, taking the two causes together, the strawberry season—though perhaps beneficial to some constitutions—is the occasion of much ill health among the American people."

This binding action of so popular a fruit as the strawberry is just the reverse of what might be expected, when we take into consideration the numerous small seeds of the berry, which, it would be supposed, would tend to promote discharges from the bowels by mere mechanical action.

It occurred to Professor Storer several years ago that Liebig's theory that the cathartic action of many saline medicines should be referred to their osmotic relations to the membranes of the intestinal canal and the blood vessels might be extended and made the basis of a rational treatment of constipation. He reasoned that it might perhaps be easy to annul the tendency to constipation so common in the hot, dry weather of early summer, by "checking or diverting the course of some part of the water which would naturally be exuded by the skin at this season, and causing it to pass into the rectum." This result he thought might be brought about by eating or drinking, frequently, small quantities of harmless indigestible colloid substances, which, while holding water forcibly, could not readily pass through the walls of the stomach by osmose, and would therefore reach the rectum as a liquid, and prevent its contents from becoming hard. He states that it is not improbable that the pulp-like flesh of prunes and tamarinds contains just such an inert indigestible colloid substance, and that to its presence is due the medicinal efficacy of these fruits. However true this may be, he has had no time as yet to study the matter; but having lately noticed that the action of one of the many mineral waters now in common use is closely analogous to that of his proposed colloid medicament, he deems the conception worthy of being kept in view and subjected to further tests. He finds that Friedrichshall bitter water, taken in doses of a small wineglassful three or four times a day, is an effectual cure for the constipations of early summer, and for those produced by strawberries; not that the water in these small doses acts as a cathartic, but that it carries enough water to the rectum to keep its contents soft. He has, however, prepared a solution of far less disagreeable taste than that of the Friedrichshall water, and equally effective against the kinds of constipation under consideration, by simply dissolving 15 grammes of Epsom salt and 8 grammes of common salt in a quart champagne bottle full of water. A small wineglassful of this solution may be taken on going to bed at night, on arising in the morning, in the middle of the afternoon, and of the forenoon also, if need be. Sometimes a couple of doses will be all-sufficient, taken at night and morning. These salts can be obtained almost everywhere, and may readily be carried about in traveling, in the form of dry powders, to be dissolved in water whenever they may be needed.

The mode of action of these small doses of saline matters is possibly to be explained on the old theory that the salts have a tendency to detain the water in which they are held in solution, and to prevent its passage through the walls of the intestines by osmose, thus allowing to be carried into the rectum a certain amount, which but for the presence of the salts would have been discharged through the skin.

PROFESSOR LANGLEY'S PAPERS ON THE SUN.

Those who are familiar with Professor Langley's high rank as a skillful observer of solar phenomena will not need to have their attention specially called to the series of articles on the sun which he has prepared for this paper. For freshness of information, clearness and aptness in illustration, they will be found superior to anything that has appeared on this subject for a long time. The article on eclipses, in this week's issue, is particularly timely, and we trust that not a few of the readers of the SCIENTIFIC AMERICAN will follow his advice in observing the coming eclipse and in reporting their observations. As Professor Langley shows, it is often in the power of non-professional observers to add materially to the scientific results obtained during the progress of such rare and imposing phenomena. The circumstance that the line of totality passes for the most part over a sparsely settled region makes it all the more important that every one who has an opportunity to witness the eclipse should become, if possible, for the moments of darkness at least, a scientific observer.

DESTRUCTION VS. CONSTRUCTION OF IRONCLADS.

While other nations are expending immense sums in the construction of heavy ironclads, and without apparently coming any nearer to a decision as to which is the more irresistible, shot or armor, we are wisely giving especial attention to studying how they may best be destroyed and now that our naval officers have become so familiar with the management and the capabilities of the submarine torpedoes, we expect soon to hear of an aerial torpedo, which, propelled by steam or compressed air or after the manner of a rocket, may as successfully attack the deck as the other can the bottom of these ships.

While political conditions demand of others that they should perfect and multiply all means of attack, we, fortunately, may confine ourselves to those of defense, making ourselves impregnable against scores of ironclads at less than the cost of two or three of them.

How Raisins are Prepared.

A strip of land bordering the Mediterranean, somewhat less than 100 miles in length and in width not exceeding 5 or 6, is the raisin producing territory of Spain. Beyond these boundaries the Muscatel grape, from which the raisin is principally produced, may grow and thrive abundantly, but the fruit must go to the market or the wine press. When the grapes begin to ripen in August the farmer carefully inspects the fruit as it lies on the warm dry soil, and one by one clips the clusters as they reach perfection. In almost all vineyards slants of masonry are prepared, looking like unglazed hot beds, and covered with fine pebbles, on which the fruit is exposed to dry. But the small proprietor prefers not to carry his grapes so far. It is better, he thinks, to deposit them nearer at hand, where there is less danger of bruising, and where bees and wasps are less likely to find them. Day by day the cut branches are examined and turned, till they are sufficiently cured to be borne to the house, usually on the hill top, and there deposited in the empty wine press, till enough have been collected for the trimmers and packers to begin their work. At this stage great piles of rough dried raisins are brought forth from the wine press and heaped upon boards. One by one the bunches are carefully inspected, those of the first quality being trimmed of all irregularities and imperfect berries and deposited in piles by themselves; so in turn are

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treated those of the second quality, while the clippings and inferior fruit are received into baskets at the feet of the trimmers and reserved for home consumption. A quantity of small wooden trays are now brought forward, just the size of a common raisin box and about an inch deep. In these papers are neatly laid so as to lap over and cover the raisins evenly deposited in the trays, which are then subjected to heavy pressure in a rude press. After pressing the raisins are dropped into the boxes for market.

THE SUN.

BY S. P. LANGLEY, ALLEGHENY OBSERVATORY, PA.*

A "TOTAL" ECLIPSE.

Every one has seen an eclipse of the sun of some sort, but a "partial" eclipse as seen through a piece of smoked glass, though no doubt a curious and interesting, can hardly be called an imposing phenomenon. From some such experience, perhaps, many form an idea of what a "total" eclipse may be like, but in reality there is hardly any resemblance. Not only is a solar total eclipse, by general agreement, the grandest and most imposing spectacle nature offers, but it is to most the rarest of all; the chances being against any average human life's bringing the opportunity to see one from any given place on the earth's surface.

Besides this it is a most important opportunity for seeing certain things about the sun which are never visible even to the most powerful telescope at any other time. We say "about," and not "on," advisedly, for the things in question belong to a region extending out from the sun into space, where every feature is usually obliterated by the greater brilliancy of sunlight. It is only when this is withdrawn, and we are in the shadow of the moon, that the "corona" appears, though it is always existing there; as the stars are by day in the heavens unseen till the shadow of the earth makes night. When such an event as a total eclipse occurs, observers therefore travel if necessary across the globe to see it, though the spectacle lasts usually less than five minutes; and one such is to appear in the Territories of the United States on the 29th day of the present month.

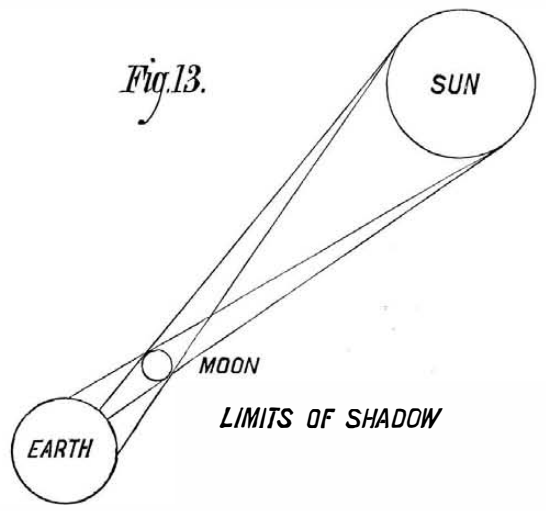
It will be seen from the annexed figure (Fig. 13) that when the moon comes between the sun and earth, two shadow cones are formed; one (the larger) within which the observer will have his view of part of the sun cut off by the intervening body (and see a "partial" eclipse), the other cone marking the limits within which the whole sun is rendered invisible, and the eclipse is total.

The first cone grows larger and larger as we go away from the moon in the direction opposite the sun, the second smaller and smaller. If the moon were a little further off than it is, the apex of this second cone might be reached without its touching the earth at all, and as her distance is variable this in fact sometimes happens. The moon is always so far away (and so small compared with the sun) that the section of the inner cone where it strikes the earth is at all times small, or, in other words, the part of the earth whence a total eclipse can be seen is never more than a very small portion of the whole. The section of the inner cone where it strikes the earth is (where the sun is vertical), generally speaking, a circle of less than 200 miles in diameter, and as this section is carried along by the moon's motion and the earth's together, it sweeps over the surface of our globe in such a narrow belt as is shown in Fig. 14, which is taken from the *American Nautical Almanac*, with a very slight modification that the heavy black line across the continent marks both the track along which totality lies and the width of the very narrow region through which alone it is visible.

When from an elevated station we watch the progress of a total eclipse, the sun's disk is seen to be slowly invaded by the advancing moon, and as the solar brightness is gradually reduced to a thin crescent, daylight fades with increasing rapidity, and a quite peculiar and unnatural light, hard to describe but which no one forgets who has once seen it, spreads over the landscape. Then, and suddenly, we come to a new sense of the reality (if I may so speak) of the heavenly bodies, for the moon, which we have been accustomed to see as a disk of distant light on the far background of the starry skies, takes on the appearance of the enormous solid sphere which it is, and a faint glow within its circumference (due, perhaps, to reflection from the corona) makes its rotundity so perceptible that we feel, perhaps for the first time, the perpetual miracle which holds this great cannon-ball-like thing from falling. But almost at the same moment we become aware that its immense shadow is rushing toward us, blotting out the landscape, and advancing like a material darkness with an effect actually terrifying.

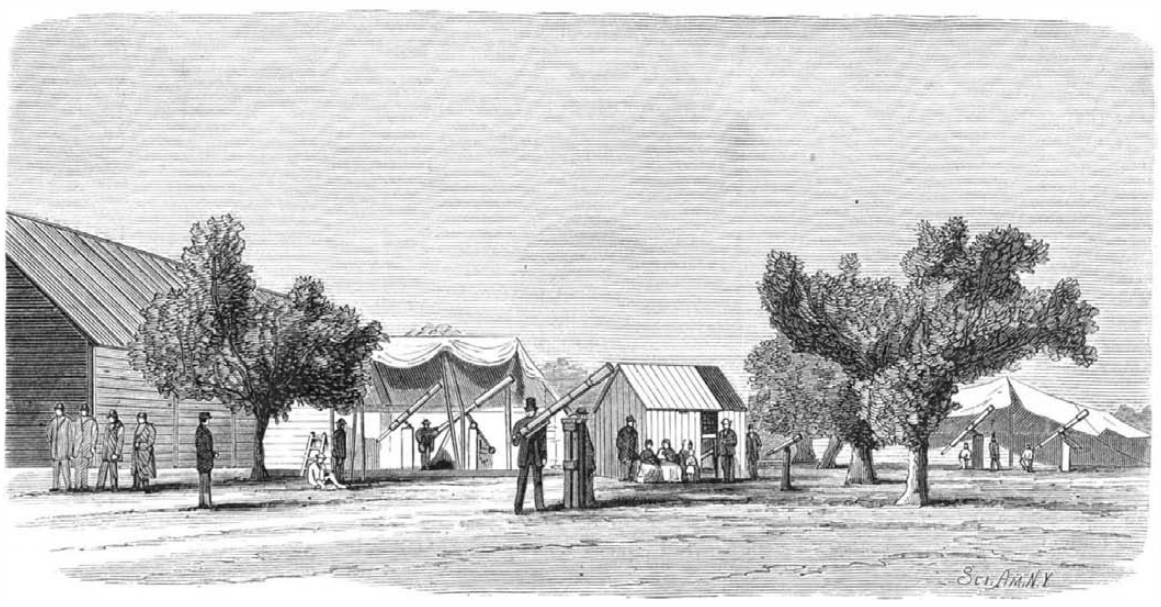
Lest I seem to exaggerate, let me quote the words of another, a trustworthy and careful witness. Principal Forbes, watching the eclipse of July, 1842, in Europe, says of this: "I perceived in the southwest a black shadow like that of a storm about to break, which obscured the Alps; it was the lunar shadow coming toward us. Those who have seen a locomotive approach at the rate of 40 miles an hour can judge of the stupefaction caused by the approach of this black column with all but lightning speed. I confess it was the most terrifying sight I ever saw. As always happens in the case of sudden, silent, unexpected movements, the

Fig. 13.



spectator confounds real and relative motions—I felt almost giddy for a moment, as though the massive building under me bowed on the side of the coming eclipse."

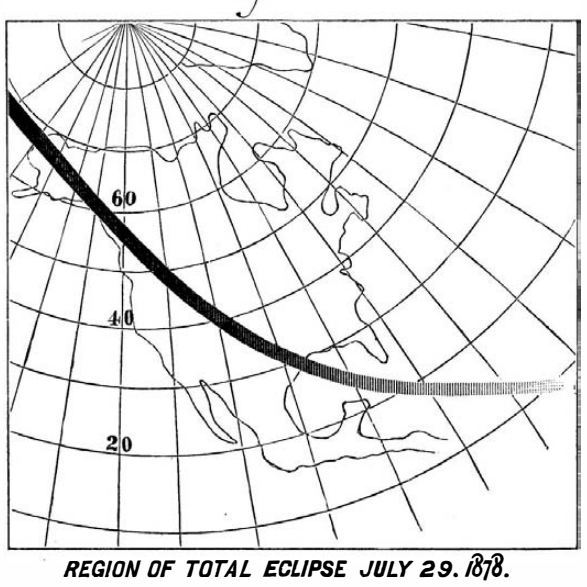
Another witness, Captain Biddulph, says:- "The light cloud I saw distinctly put out like a candle. The rapidity of the motion of the shadow, and its intenseness, produced a feeling that something material was sweeping over the earth at a speed perfectly frightful. I involuntarily listened for the rushing noise of a mighty wind."



"ECLIPSE ENCAMPMENT."

The shadow having involved us, we look up to the place the sun occupied a moment ago, and find in its stead a black circle, around the edge of which are irregular flames, or what seem like flames, chiefly of a rose red, rising in fantastic shapes to heights which in some cases have exceeded 80,000miles (Fig. 15, p. 50). These are not always present in equal quantity. In the eclipse of this month they will probably be few, but they are always a beautiful spectacle. The

Fig. 14.



REGION OF TOTAL ECLIPSE JULY 29. 1878.

illustration annexed (Fig. 15) is taken in part from a paper in the notices of the Royal Astronomical Society, describing the English observations of an eclipse in India, and gives a fair idea of the sizes of these "flames" compared with that of the sun. The variety and in some cases beauty of the "flames" themselves, when studied separately by the spectroscope, are very great, and even as small as the scale of the drawing is, they exhibit great diversity of outline. None are here seen entirely detached from the sun, and floating cloudlike above its surface, but such are sometimes visible. At the time of the eclipse at which this drawing was taken, the "flames" were the objects of principal curiosity, and it was even uncertain till then whether they were attached to the sun or moon. But the dark body of the moon was distinctly seen to advance over them, and their fluctuating character was exhibited by drawings taken a short distance of time apart. Thus the great prominence at A is shown on an enlarged scale at A′ with its curious twisted structure as it appeared to the English observers at Guntoor, while at B is another enlarged view of the same prominence as it appeared at Mantawalock which the eclipse reached later. It is very plain that its form has altered in the interval. The curious spiral, striated structure of A has also been observed by Professor Abbe of the United States Signal Service in portions of the corona itself, or in what appears to be such. The whole structure of these red "flames" allies them with the delicate cloud forms described here as seen in spots, and it will likewise be noticed that they are shown on the figure as not being seen about the solar poles, a region from which the spots are also absent. Beyond them, stretching out into space for distances sometimes equal to the sun's entire diameter, are brushes of pale light, whose extremities some describe as perceptibly curved and scintillating, or at least fluctuating. (These were to me the most striking thing in the eclipse of 1869.) It is not entirely certain how far these brushes are a real solar appendage, for something like them can undoubtedly be produced by the rays of the sun broken by the ragged mountainous edge of the moon, and seen reflected from the distant parts of our own atmosphere, in such a way that by an effect of perspective they seem to be entirely without it (Fig. 16). Nearer to the body of the invisible sun the light grows brighter and more continuous, till close to the black moon it becomes much brighter than full moonlight would be, and gives so much light that in the complete absence of the sun only the brighter stars are visible. The darkness is then by no means absolute, and it is further lessened by light reflected from regions in the extreme horizon, which are without the limits of totality.

The red flames are a part of what is called the chromosphere of the sun. The rest of the appearances described belong to the corona, the crown or glory about the eclipsed orb, as they seem, looking, in fact, much like the aureole represented by painters about the heads of saints. Fig. 16, p. 50 represents the inner corona and red flames as drawn by Professor J. H. Eastman, U.S.N. Fig. 17 is from a sketch by Tacchini, and shows the more extended corona rays as seen at the eclipse of December, 1870. The total phase lasts at the longest six or seven minutes, but rarely as much as that. In the case of the eclipse of 1870, observed at the station of Xeres de la Frontera, by the U. S. Coast Survey eclipse expedition, the whole duration was two minutes and ten seconds, and for the opportunity afforded by this brief interval the ocean had been crossed by a whole body of observers. Two principal parties were dispatched for the purpose by our Government, and the operations of that at Xeres, under the direction of Professor Winlock, may be taken as an example of the care and preparation used on such an occasion.

The party in this case consisted of fourteen, eleven of whom were from this country, and the station (in a vineyard near the town of Xeres) presented, from the number of the tents, the appearance of a military encampment (Fig. B). Every variety of instrument that science uses at such a time was in requisition: huge telescopes, solidly mounted and driven by clockwork, carried photographic apparatus; others spectroscopes; close by was a heliostat and horizontal telescope 40 feet in length, also for photography. Other telescopes were directed so as to form cameras, for sketching the corona; still others bore polariscopic apparatus for determining the character of its light. Elaborate provision for measuring its brightness was made, and in charge of a little division of the party in a neighboring orange grove, while a coast survey transit station had been improvised, with mounted transit, chronograph, chronometers for determining the time, and telegraphic connections established for the purpose with the Spanish Observatory of St. Fernando, near the city of Cadiz. Each of the observers had drilled himself for weeks beforehand in every part of every observation to be made by him, and there was such subdivision of labor that each had one thing only to do. As the critical moment approaches, lamps are lighted. Clouds are sweeping over the sky, and it has been raining a few minutes before, but now a break in the clouds appears about the sun, showing the light dwindled to

* For Part I. see SCIENTIFIC AMERICAN of July 20.

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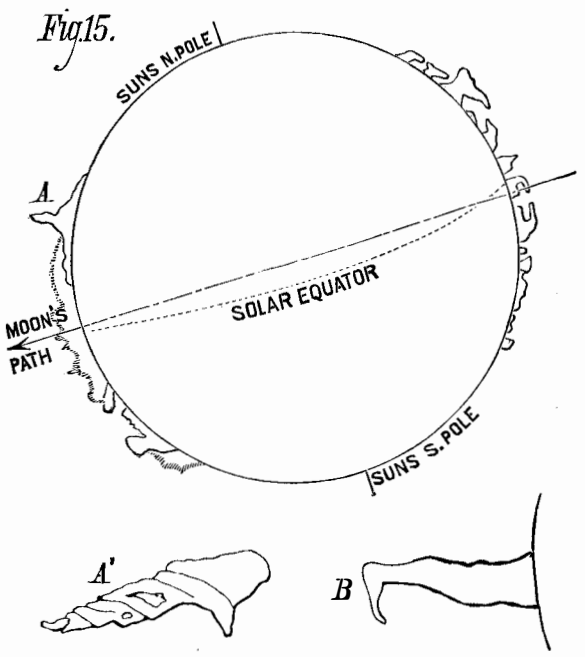
that of the thinnest crescent moon. A moment more and darkness seems to come suddenly down; the groups of spectators around the confines, kept back by sentinels, grow indistinct; an utter silence settles with the falling night, and for two minutes is unbroken; and while this silence lasts it may be safe to say that every observer has every faculty of mind or body that will serve his work bent on it with such a tension as one must have experienced to understand. Even while it seems to each as if he had only begun to do what he

Fig. 15.

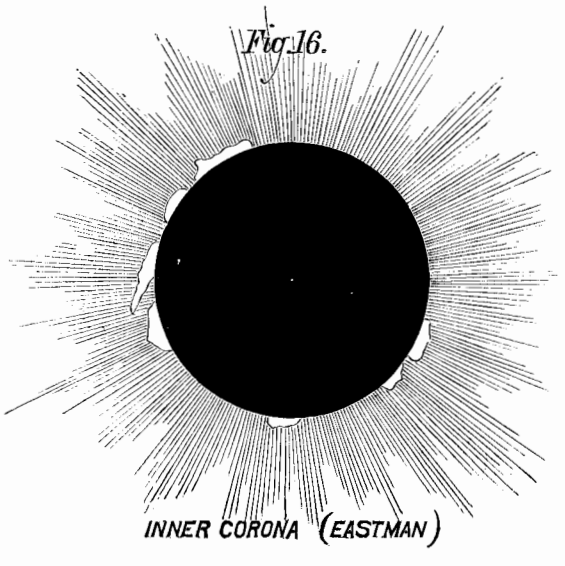


wishes to accomplish, something seems to whirr past overhead, and turning the eyes we see the retreating shadow flying over a distant chain of mountains, which bounds the eastern horizon, while the sun's rays come out as suddenly and as dazzlingly as those of an electric lamp. It is over, and what those brief minutes have yielded is being written down by each one, while every impression is fresh in mind, before he leaves his post. This done, voices break out again; there are comparisons, congratulations, and regrets; but nothing can be done now but to leave the work as it stands, with the feeling, we may hope each has, that he at any rate did his best, whether that turned out much or little.

What knowledge have such labors brought us? Not nearly all we could wish, it must be confessed, for the corona is still in great part a mystery. The spectroscope shows that its light consists largely of a line in the green part of the spectrum, very nearly coinciding with an iron line ("1474, Kirchoff"). It was for a time inferred that it might be largely composed of iron vapor, but this supposition, never a very probable one, has been disproved by Professor Young, who with one of the recent very powerful "grating" spectroscopes has shown that the coronal line is not identical with the iron one, as supposed, and that the collocation probably means nothing. It is very difficult to see how the corona can be vapor of any sort, for the reason, among others, that comets have been known to pass through it without any visible effect on these excessively light bodies.

The most recent investigations seem to point to the conclusion that the corona is composed of an infinitude of minute discrete particles, somewhat like a dust cloud, but intensely hot from the neighborhood of the sun. This leaves us, however, with the difficulty of determining why these particles do not fall upon the sun's body. Now we must

Fig. 16.



either suppose them to be moving about it, like other bodies obeying the law of gravitation (and there are several difficulties in the way of this), or suppose them to be kept away from the sun by a repulsive force. Fanciful as this last supposition may seem to be at first sight, it is not to be dismissed as impossible in the present state of our knowledge, which is leading us to look on the existence of such forces co-existently with gravitation (such as we familiarly know it) as even probable. It is to be hoped that our coming eclipse may do much toward settling such questions.

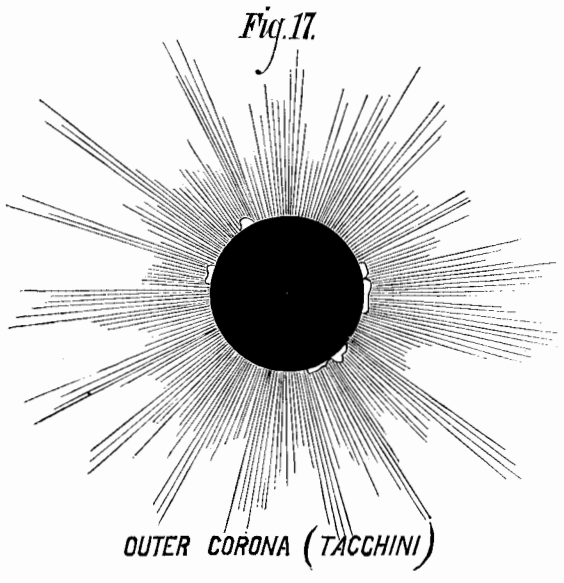
The "red flames" which have been spoken of are an object of far minor importance at an eclipse than formerly, because, according to the well known discovery of Messrs. Jannsen and Lockyer, they can be made now visible at any time without an eclipse by the spectroscope. They constitute, however, a beautiful addition to the eclipse phenomena, and one point at least may be noted during the totality which the spectroscope alone could not tell us of—that they are not all of the rose red mentioned, but that occasionally some of a more nearly orange hue have been seen, thus marking the presence at great heights above the sun of other substances than hydrogen, to which the principal color is due.

It may perhaps be of interest, in view of the immediate approach of the eclipse, to give the approximate times of its occurrence in some of the principal cities where this will be read. By help of the computations of our Nautical Almanac Office we find:

Place.	Local time of beginning.	Of ending.
New York.....	4h. 47m.	6h. 33m.
Philadelphia.....	4h. 43m.	6h. 31m.
Baltimore.....	4h. 38m.	6h. 26m.
Cincinnati	3h. 58m.	6h. 02m.
Chicago.....	3h. 42m.	5h. 41m.
Pittsburg.....	4h. 20m.	6h. 12m.
New Orleans	3h. 51m.	5h. 52m.
San Francisco.....	0h. 52m.	3h. 17m.

It is possible that this article may fall into the hands of some one residing where the eclipse is total, and who may wish to be able to make some observation of service. None is likely to be so useful as a drawing made on the spot—not "corrected" or "improved" by subsequent retouching—and accompanied by any remarks as to the features of the corona seen by the naked eye or with the telescope. These may be sent to the Naval Observatory, Washington. A large number of parties will visit the eclipse track, and many of them have started with the beginning of the month to be early in the field and to make every preparation on the ground. Among these are several European astronomers of high reputation, and it seems at present as if no previous eclipse is likely to have received the attention to be bestowed on this.

Fig. 17.



We must not forget how completely all are at the mercy of the weather at such a time, and how large the risk is which all take that their labor and time will be rendered valueless by an hour of cloudy sky; and remembering this, we will wish for all clear weather and full success.

The Bishop of Manchester on British Trade Depression.

In a lengthy letter to the *Courier*, of Manchester, the Bishop of that diocese has "freed his soul" of his opinions upon the strike in Lancashire and the general depression of trade. He profoundly deprecates the contest being waged by masters and men, and while disclaiming the character of an arbitrator, or even of a mediator, counsels the strikers to accede to their employers' demands, which he seems to regard as justified by the circumstances into which they find themselves thrust. He argues that no display of strength can prevent a future further reduction, if such reduction be necessary as the only way in which trade can be carried on at a profit, and then he proceeds to deduce from the experiences in the iron and coal trades arguments in support of his counsels. He says: "In the interests of labor as well as of capital, I would invite the attention of both parties to certain phenomena which have come within my own knowledge or observation, and which I regard as typical. The iron trade of South Wales has disappeared, and, Lord Aberdare told me, in his judgment, is not likely to revive. The look of the country is described to me by those who have seen it as being as desolate as if it had been overrun by a foreign foe. I was told two days ago by a man, himself once a miner, and now the coachman of a Wiltshire friend of mine, who has friends in the smitten district, that the people are emigrating in all directions, and, as he expressed it, are being sent off by shiploads. 'What is the cause of this?'

case. 'Oh,' he said, 'the strike; though I don't know what they struck for, for they were earning, many of them, £2 10s. a week, and twenty years ago, when I worked in the pits from five o'clock in the morning to seven o'clock at night, it was only with a "scrabble" that I could make my pound or five and twenty shillings.' At any rate, whether my informant's view of the case is correct or not, here is a district, once the home of a thriving and remunerative industry, now reduced to the condition of a wilderness. A month ago I traveled up to London with the managing director of one of the largest engineering works in Manchester, himself well known as a man of the highest intelligence and capacity for business. 'What are you doing?' I asked. 'Not much,' he answered; 'we have reduced our number of hands, and I don't know how much longer we may have anything to do for those who remain. We have just had to refuse an order that would have been worth £45,000.' 'Why?' I asked with surprise. 'A foreign railway company invited us to tender for twenty locomotives. We offered to build them for £2,200 each; the company would only give £2,000. There was not much profit to be got out of the transaction, but to keep the men employed we were willing to have undertaken it, if we could save ourselves from loss. So we called the heads of departments together, who are all working by piece work, and asked them if they would help us to accept the order by reducing in fair proportion the wages that were being paid to them, so as to leave some small margin of profit to the shareholders. They to a man refused, and we had to decline to enter into a contract which would have been worth £45,000.' I am not able to estimate how much of this sum represents the loss in wages to the men, whom it would probably have kept in constant employment for half a year. It may now have gone into the pockets of some foreign competitor whose existence Mr. John C. Fielden and the great body of the operatives seem utterly to forget or ignore. I was informed recently, upon authority that seemed to me sufficient, that Blockow, Vaughan & Co. are sending the pig iron which they have made into Belgium to be manufactured into girders, rails, etc., and to be re-imported into this country for use, simply because the work can be done quite as well and more cheaply there than here. Mr. R. W. Dale, in his 'Impressions of America,' published in the *Nineteenth Century* for April (p. 769), asserts distinctly that 'in Birmingham itself merchants are importing from the United States such articles as axes, hayforks, and agricultural implements of nearly every description, sash pulleys, and "small castings" of many kinds, although it is estimated that freight and other expenses are 17 or 18 per cent to the cost of the goods,' while 'the Lowell manufacturers, who are aghast at the prospect of free trade, are actually sending cotton cloth to Manchester, and in American retail stores cotton goods are marked at a lower price than that at which goods of the same quality could be sold in Liverpool or London.' He expresses a 'doubt whether, if the protective duties were swept away to-morrow, our own manufacturing industry would receive at once the general stimulus which some sanguine persons might anticipate. Leeds and Bradford might become more active, but that the Lancashire and Birmingham manufacturers would recover their old place in the American market seems extremely improbable.' These instances and forebodings could easily be multiplied, if it were necessary; but I think that what I have said is enough to show that the operatives' theory of the present depression of trade is not a complete account of the case; which, of course, if to any extent it is due to foreign competition, anything that embraces the cost of production at home—as working short time must do—throws the advantage still more into the hands of our competitors abroad. Indeed, it is the one fact of this foreign competition so seriously imperiling our position as a manufacturing nation in the markets abroad, and even, if Mr. Dale's 'impressions' are true, in the market at home, that presses itself home to my mind as the great motive that ought to stimulate both parties to the present strife to a speedy reconciliation of their differences." Proceeding, he treats trade unionism at considerable length. He does not condemn the principle, which he agrees has probably worked good in those who have adopted it; but he blames such of its adherents as use it in promotion of movements which have neither common sense nor experience to back them up, and characterizes as absurd the idea widely obtaining, that were unionists to make the concessions asked, a death blow would be struck at their cherished institution. "Trade unions must take care," he says, "that in their eagerness to get the golden eggs they do not kill the bird that lays them."

A New Insect Pest.

Psyche, the organ of the Cambridge Entomological Club, notes the recent introduction into the United States of a weevil which devours the foliage of many beautiful plants, and suggests to florists who have been troubled by it that it will be for their advantage to search, at this time of the year, in the flower pots and in all waste soil about their hot houses for the larvæ and pupæ of these pests. The larvæ, which feed upon rootlets, are now pupating, and the destruction of every individual prevents the laying of a large number of eggs during the coming season.

Death of a Giant.

William Campbell, the Scottish giant, died lately at Newcastle-on-Tyne, at the age of twenty-six. Campbell had been exhibiting in London at the Egyptian Hall, and returned to

feet 3 inches, and weighed 728 pounds, measured 96 inches round the shoulders, 76 round the breast, 47 round the thigh, and 35 round the calf of the leg. He was the biggest man in the United Kingdom, and, so far as report goes, in the world.

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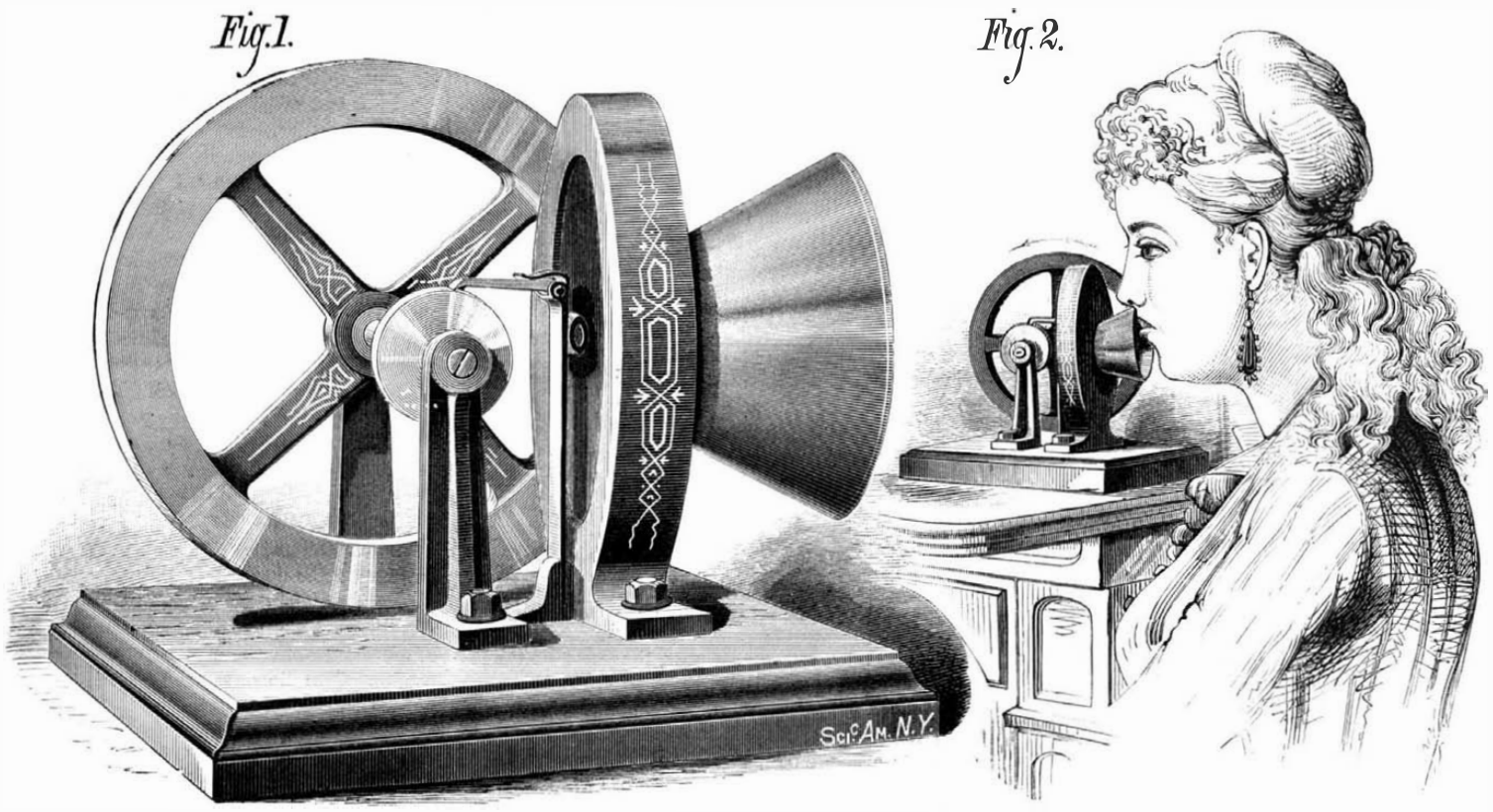
EDISON'S PHONOMOTER.

It is admitted that there is power in the human voice, but hitherto this power has been applied indirectly to produce mechanical results.

Mr. Edison in his telephone and phonograph experiments discovered that the vibrations of the vocal cords were capable of producing considerable dynamic effect. Acting on this hint he began experiments on a phonomoter, or instrument for measuring the mechanical force of sound waves produced by the human voice. In the course of these experiments he constructed the machine shown in the engraving, which exhibits the dynamic force of the voice.



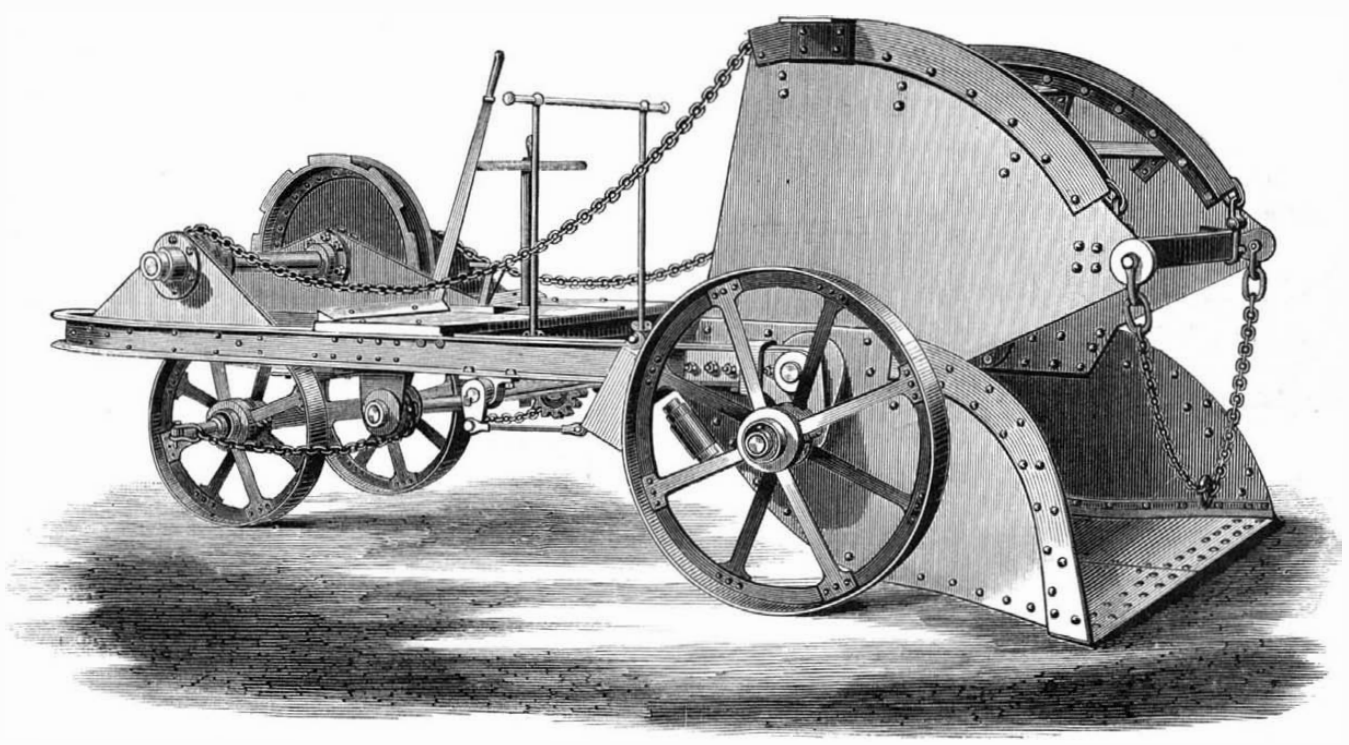
EDISON'S PHONOMOTER.

The machine has a diaphragm and mouth piece similar to a phonograph. A spring which is secured to the bed piece rests on a piece of rubber tubing placed against the diaphragm. This spring carries a pawl that acts on a ratchet or roughened wheel on the fly wheel shaft. A sound made in the mouth piece creates vibrations in the diaphragm which are sufficient to propel the fly wheel with considerable velocity. It requires a surprising amount of pressure on the fly wheel shaft to stop the machine while a continuous sound is made in the mouth piece.

Mr. Edison says he will have no difficulty in making the machine bore a hole through a board; but we consider such an application of the machine of very little utility, as we are familiar with voices that can accomplish the feat without the mechanical appliance.

EXCAVATING SCOOP.

We give herewith a perspective view of an excavating scoop made by Messrs. John Fowler & Co., of Leeds, England, and represented by a model at their stand at the British Agricultural Machinery annex at the Paris Exhibition. This implement is one originally designed for making large ponds or reservoirs, 100 yards square and 25 feet deep, for Australian sheep farmers, but its successful employment for this purpose has led to other applications of it, and it is now used for other descriptions of excavating work and particularly for leveling land and constructing dams.



EXCAVATING SCOOP.

The scoop is worked by drawing it backward and forward between two steam plowing engines in the same way as the implements employed in the double engine system of steam plowing tackle, the engines being placed one on each headland, and the implement being pulled backward and forward between them. The scoop, however, cuts or fills only in one direction, and one of the engines is employed to do this work, the other engine being used only for pulling the loaded scoop to the point where it is required to deliver the spoil.

The scoop, as shown in the engraving, is in position for being filled. The scoop is drawn forward by the engine whose rope is coupled to the chain hanging from the scoop box. When the scoop is sufficiently full the man on the scoop gives the signal to the engine driver to stop pulling and throw his engine out of gear. After this is done the signal is then given to the opposite engineman to start his engine, but before he does so the scoopman withdraws a stop from the tipping drum, which allows the latter to revolve. So soon as the engine exerts its power upon the rope, the drum revolves and also turns the chain barrels, round which are coiled the lifting chains, which are coupled to the sides of the scoop box, as shown in the engraving. The scoop box is thus caused to turn round its center; and so soon as the scoopman sees the box sufficiently clear of the ground and in position for carrying the spoil away he shoots the stop bolt into one of the notches in the rim of the tipping drum, and stops the action of the latter.

During the time this is going on (which is very short) the implement has stood still, but as soon as the tipping drum has been locked and becomes a rigid part of the frame, the engine pulls the implement in a backward direction to the requisite place for emptying. When within a few yards of the required position, the scoopman again pulls out the stop and the box is tipped over the rest of the distance it has got to travel to empty itself. The engineman is now signaled to stop, the box being by this time in an almost vertical position. The engineman who drives on the filling side is next signaled to go on; and when the implement moves back again empty, the box being in a vertical position, the earth which it has deposited is evenly spread by the mouth or cutting edge of the scoop box.

When the implement is far enough away from the place where the spoil has been deposited, the bolt is again withdrawn, the scoop box allowed to resume its middle position, the bolt shot in, and the scoop again run to the place where it left off work at the previous bout. The bolt is then again withdrawn and the box is pulled into position, and is ready for work as before. The implement is a useful one for many purposes, and in suitable situations can perform a very large amount of work. We take our illustration from *Engineering*.

New Mechanical Inventions.

An improved Fan Blower has been patented by Robert Waskey, of Blue Ridge, Va. It consists in a series of fans placed upon a shaft, and arranged so that the first fan in the series discharges into a chamber that communicates with the second fan in the series, and the last fan discharges into the pipe that conveys the wind away to be utilized. To increase the capacity of the blower, it is only necessary to add other fans, the speed at which it is driven remaining the same.

An improved Fare Register has been patented by Julius Bluemel, of San Francisco, Cal. This invention relates to a device for registering cash fares, and clipping and registering tickets; and it consists in a case having glass sides, and containing a clipping device, a bell which rings when the clipping device is operated, a registering device for recording each ticket clipped, and also a device for registering the cash fares.

James C. McIntyre, of Fort Edward, N. Y., has patented an improved machine for preparing Wood Fiber for Paper Pulp, which is designed to prevent the formation of long and large fibers or splinters, so as to enable timber of any desired or convenient size or thickness to be operated upon. The timber is carried against the saws automatically, and the feed table is brought forward automatically (when one cut is completed) into proper position to enable the timber to be fed forward for another cut.

Wm. C. Howard, of Grahamville, S. C., has invented an improved Machine for Hulling Rice, which is designed especially for family use, but which may be made of any desired size and capacity. This invention cannot be properly described without engravings.

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An improved Station Indicator has recently been patented by Sabin W. Colton, of Philadelphia, Pa. The object of this invention is to provide an indicator for accurately indicating streets or stations. It is intended for street cars, and is designed mainly for the convenience of passengers.

Rudolph A. Stahn, of South Stillwater, Minn., has invented an improved Shingle Press, by which the shingles may be bunched, pressed, and tied with facility, the press being furthermore so constructed as to be readily taken to pieces, shipped, and set up again for work.

James T. Beckwith, of Cameron Mills, N. Y., has patented an improved Device for Leveling and Tramming Millstones while at work. This invention consists in combining, with a mill spindle, two spirit levels and an adjustable step, so that the spindle and stone may be regulated while the mill is running.

Thomas Boardman, of Charlottetown, Canada, is the inventor of an improved Machine for introducing, at one operation, into a length of stovepipe, all of the Rivets employed in fastening the pipe together. After the rivets are inserted they are set down by a hammer in the usual way.

Thomas B. Rogers, Jr., of Brooklyn, N. Y., has patented an improved Shutter Bower and Fastener, which consists of a plain rod jointed to an ear that is attached to the blind near its hinges, and fastened in a pivotal stud by a binding screw and plate attached to the window sill for receiving the said rod.

An improved Wind Engine has been patented by La Fayette Brayman, of Gilbert Station, Ill. The object of this invention is to provide a wind motor for the heavier kinds of work, such as pumping large quantities of water, operating stamp mills, and for other purposes, where an inexpensive power is required. The invention consists in two series of wind wheels, placed on horizontal shafts, which are arranged at right angles to each other, and are geared together, so that either or both series may be employed in driving machinery.

Pleasant A. Chalfant, of Independence, Cal., has perfected and patented an improved Newspaper Wrapping and Pasting Machine, which consists in a combination of devices for wrapping and pasting newspapers and pamphlets for mailing, which cannot be properly described without an engraving. The machine takes the papers from one table and the wrappers from another table, and folds the paper, pastes and applies the wrapper, and delivers the paper at the side of the machine ready for addressing and mailing.

Treatment of Acute Rheumatism.

At a late meeting of the Glasgow Medical Society, Dr. Charteris reviewed the various modes of treatment of acute rheumatism which had been practiced, from the comparatively moderate venesection of Sydenham down to the more modern methods. Among these latter he specially adverted to the mode of blistering in succession the affected joints, and giving alkalies to neutralize the acid produced in the course of the disease. This was an improvement on former methods; it shortened the disease by ten days, and heart complications were believed to be reduced in frequency. The treatment by salicin or salicylic acid was then introduced, and this he looked upon as the best treatment for acute rheumatism at present known, and of the nature of a specific. Relief was experienced in from thirty-four to forty-eight hours, and the temperature also fell. Heart complications were not averted, except indirectly by the arrest of the disease. If the disease was very acute, with severe head symptoms, they must not trust to the salicylates, but to cold baths. Experience had led him to the conclusion that salicin should not be continued after the temperature reached 99°. If continued longer it exercised a depressing effect.—*Medical and Surgical Reporter.*

How a Horse Trots.

By means of a series of cameras standing one foot apart and operated by electricity, a California photographer, Mr. E. J. Muybridge, has succeeded in taking negatives of every phase of a trotting horse's action while making a complete stride. In this way it becomes possible to study the successive positions of a horse's body, legs, and feet while he is going at full speed. The horse photographed was Mr. Leland Stanford's trotter Occident, while traveling at a 2:24 gait, with a stride of 18 feet 6 inches. The San Francisco *Bulletin* reports that the photographs show the fast trotter's feet to be all off the ground together twice during the making of the stride, contrary to the assertions of the authorities hitherto accepted.

Danger of Carbolic Acid Dressings.

A sort of reaction against the use of carbolic acid for antiseptic dressings seems now to be imminent, notwithstanding the brilliant success it has met with in Germany in the hands of Dr. Lister and others. According to the *Pharmaceutical Journal*, Dr. Kuester, at the late meeting of the German Surgeons' Congress, in Berlin, delivered an address on the toxic effects of carbolic acid dressings, in which he stated that within the last three years he had seen five cases of such poisoning, four of them terminating fatally. He expressed his belief that from the uncertainty of the symptoms shown in such cases, many might have been mistaken as cases of collapse or shock. He found, from experiments made on dogs, that 0·076 per cent of the body weight constituted a fatal dose of carbolic acid; but small animals and persons in weak health, or faint from loss of blood, were liable to be affected by smaller doses. He had found the antidote of Sonnenburg, sulphate of soda, to be of value only in lighter cases, and such as were of a less acute character. Professor Koenig, of Göttingen, who at the same meeting advocated permanent irrigation in all cases of an already established sepsis of wounds, recommends exclusively a solution of salicylic instead of carbolic acid.

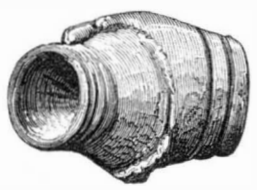
The last report of the Berlin University Surgical Clinique contains an account of the death of a child three years old from an acute carbolism after the application of carbolic antiseptic dressings, consequent upon an osteotomy on the leg. The use of such dressings, however, has now been discontinued altogether at the Berlin Surgical Clinique.

Communications.

Welded Union and Rebel Bullets.

To the Editor of the Scientific American:

I hand you herewith a curiosity in the shape of a Rebel and a Union bullet impacted in the air, which was picked up on the field during one of the numerous engagements between the Rebel forces and those of General N. P. Banks, at the time of the latter's retreat toward the Mississippi river after having been defeated in his attempt to capture Shreveport, La., in the summer of 1864. I was at that time Lieutenant Colonel Commanding the 47th Regiment, Indiana Veteran Volunteers. A portion of the regiment was deployed as skirmishers, with the main body following four hundred yards in the rear, marching by the flank. These two bullets were impacted in the air at a point between the skirmish lines of the opposing bodies, and carried to the rear of our skirmish line, where they fell, like a spent ball, near the head of the column of the main body of the regiment. Drum Major Craig, of my regiment, seeing the object fall to the ground quite near him, picked it up, supposing it to be a spent ball, but instead found it in the precise condition in which you now see it. He afterward presented it to me as a token of friendship and a memento of the events through which we were passing.



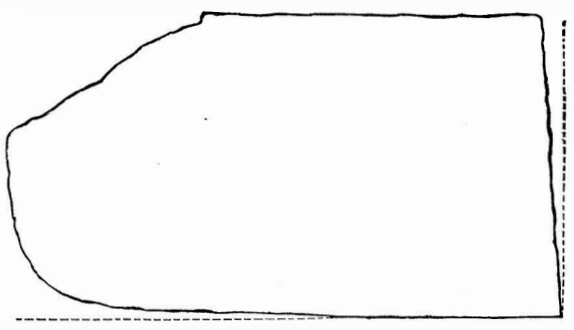
The larger bullet is the Rebel ball, which is known by the fact that it is of 0·68 caliber, of which the Rebels had a large number, and the Federal forces in the engagement had none larger than 0·57 caliber, which is the caliber of the smaller bullet. It is supposed that the larger bullet had traveled a less distance than the smaller at the instant of the impact, and possibly it was fired with a superior quality or quantity of powder; and this, together with its weight, had the effect of driving the smaller bullet back beyond the line from which it was fired.

JNO. A. MCLAUGHLIN,
Late Lt. Col. Commanding 47th Ind. Vet. Vol.
Topeka, Kansas.

Indicator of a Steamboat Engine.

To the Editor of the Scientific American:

I send you an indicator card taken from one of our best Western steamboats, the Idlewild. This boat has made the best time that has ever been made on the Ohio river, running from Cairo to Evansville (200 miles) in 15 hours and 29 minutes. As the application of the indicator to boats in the West is something new, we would like to see something from some of our engineers of Eastern boats on this subject. The above card was taken from the after end of the starboard engine; diameter of cylinder 22½ inches, length of stroke 6 feet 6 inches, speed of engine 18 revolutions per minute, steam pressure 138 lbs.; puppet valves.



J. W. P.

[The card indicates that the valves are not set in the best manner possible, the admission of steam being rather late, and the exhaust not being as free as could be desired. A slightly shorter cut off might also be desirable. We hope some of our readers will send us cards for comparison.—EDS.

A Remedy for the Effects of Poison Ivy.

Dr. S. A. Brown, U. S. N., states in the *Medical Record* that he has found a specific to the troublesome eruption produced by the poison oak or poison ivy (*Rhus toxicodendron*) so common in our woods and so often mistaken for the Virginia creeper, which the plant somewhat resembles. This specific he finds in bromine, which he has used with unvarying success in at least forty cases. He uses the drug dissolved in olive oil, cosmoline, or glycerine, in the strength of from 10 to 20 drops of bromine to the ounce of oil, and rubs the mixture gently on the affected part three or four times a day. The bromine is so volatile that the solution should be renewed within twenty-four hours from its preparation. The eruption never extends after the first thorough application, and it promptly disappears within twenty-four hours, if the application is persisted in, and the patient is entirely cured.

Thymol.

The employment of thymol as a substitute for carbolic acid in surgical dressings is, says the *Lancet*, a natural consequence of the discovery of its greater antiseptic and less septic power. A lecture on the subject has been published in Volkmann's series by H. Ranke, of Halle. The solution used instead of the 3 per cent solution of carbolic acid consists of one part thymol, ten parts of alcohol, twenty of glycerin, and a thousand of water, and can be employed as either a spray or a solution. An impregnated gauze is also used. Since thymol does not irritate the wounds, the gauze may be laid directly upon it; otherwise the same method is employed as in Lister's plan. If the gauze becomes hard and dry it may be moistened once or twice a day with thymol water. In order to prevent the evaporation of the thymol from the dressing, the gauze is covered with oiled paper. From an experience of forty-one wounds dressed with thymol the lecturer concluded that the method leaves nothing to be desired as to its antiseptic effect, and that it answers better than the carbolic acid dressing, since the secretion from the wounds is less, the period of healing shorter, and the cost of the dressings is smaller. Further it has no poisonous properties, and eczema was never observed in its use.

American Institute Exhibition.

The Managers have added three medals to the list of awards for the coming exhibition. They are "The Special Medal," "The Medal of Superiority," and "The Medal of Excellence," making in all six grades of medals, four grades of diplomas, and the usual money awards for "perishable products," as flowers, fruits, etc. "The Special Medal" will be offered for certain specified exhibits each year, and each year changed. For the Forty-seventh Exhibition, 1878, which opens September 11, the following articles only can compete for this award: An approved system of sewer and watercloset ventilation, an approved sewer trap, an approved system of refrigeration as applied to the preservation of perishable food products, an approved system and apparatus for warming dwellings, a method of propelling railway cars by steam or other motive power, blankbook writing papers, a method of automatically opening and closing hatchway doors in connection with elevators, and a system of illuminating buildings, etc., by electricity. For particulars and blanks address General Superintendent, New York city.

Copper Oysters.

An observation recently made by M. Balland on copper in oysters is interesting. A number of so-called Portugal oysters, sent from Oran to Orleans in March, showed a remarkable green coloration. On being pressed against the palate they left a sensation of bitterness or tartness, and when placed in contact for some time with a well cleaned plate of iron they deposited a thin red layer of metallic copper. M. Balland sought to determine the amount of copper by precipitation with an electric current; two oysters (without their shells) having been triturated and placed in a sulphuric acid solution, in sixteen hours 6 milligrammes of copper were deposited, and several other experiments gave this amount of about 3 mgr. for each oyster. Of the persons to whom these oysters were sent some rejected them on account of their color, others took them, and without any injurious consequences.

The Use of Antimony in Batteries.

Mr. R. J. Munn calls the attention of electricians, in the *Journal of the Society of Arts*, to the use of antimony as a negative element to replace carbon in some galvanic batteries where sulphuric acid is used as the exciting fluid. This metal, after a trial extending over five years, he claims has yielded most excellent results. Among its advantages, he mentions its low price, the absence of scaling and disintegration, and the fact that galvanic action begins almost immediately on immersion. The well known defect of brittleness of antimony when used in thin plates is overcome by Mr. Munn by casting the metal on a core of copper, or by alloying it with a small percentage of some other metal. Antimony perhaps does not form as perfect a negative element as carbon, but its great conductivity and its other qualities may render it valuable in many cases.

Photographs on Silk.

Messrs. Allard & Guyot, silk manufacturers of Lyons, are introducing a new industry—the production of photographic impressions on stuffs. They sent to a recent meeting of the Photographic Society several pieces of silk, with a variety of photographic pictures printed on them—among others, some large medallions representing pictures of the old masters. These specimens are no less than forty meters in length. The process by which they are produced is not given, but there is reason for believing that the prints are made with salts of silver. But, however that may be, this application of photography, which ever since the discovery of the art has been sought after, and made the object of numerous more or less successful experiments, appears now to have been successfully realized in the hands of Messrs. Allard & Guyot.

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HOW TO USE A FILE.

BY JOSHUA ROSE, M.E.

The excellence of a piece of work operated upon by a file is only limited by the skillfulness of the operator, because a file can be made of any required form and size, and the quantity of metal it will cut away and the location of the same may be varied at will, hence it is evident that it is possible to perform with the file every cutting operation assignable to steel tools.

The legitimate use of the file may be classed under four headings: 1. The removal of surplus metal. 2. To correct errors in the truth of work that has been operated upon by such machine tools as the planer and shaper. 3. The production of small intricate or irregular forms. 4. To fit work together more accurately than can be done by the use of other tools. With reference to the first, the domain of the file has of late years been greatly circumscribed by the introduction of special machines which will finish small work sufficiently accurate to render subsequent filing unnecessary. As a correcting process, however, filing still maintains a preeminent position from the fact that no other tool can be so delicately or minutely applied, and it is found that work produced by special or other machine tools, though sufficiently true for ordinary purposes, yet require correction in all cases where the utmost attainable exactitude and smoothness are required. One of the main reasons for this is to be found in that work to be operated upon in special machines requires to be held or clamped firmly, and as a result is almost inevitably sprung. Another reason is that in filing, the work unclamped and therefore unsprung may be tried to its place or to gauge, etc., and any detectable error remedied.

On large work this is especially the case, and for this reason the file is almost the only finishing tool.

In the production of small intricate or irregular forms the file is either used to originate a cutter or tool to be used in a machine tool, or if but few of the pieces are required it is applied direct to get out the work, machine tools being employed to rough the work out somewhat near to the required shape.

It is always desirable that the surface to be filed should lie horizontally level, and for ordinary work the face to be filed should be about the same height as the operator's elbow. If the work is large and requires a long reach, it is better to be lower, while if it is very small, so that but little pressure is required upon the file, it may be placed higher, so as to render less stooping necessary, and the eye may be able to add its scrutiny to the sense of feeling of the hand, upon which principally successful practice depends. When the work is level with the elbow the first joint of the arm is in a line with the force required to push the file, which places less strain upon the arm. This is of great consequence in filing chipped surfaces or removing a quantity of metal.

The teeth of a file are unequal in height, and as the file warps in hardening it is evident that, even supposing the operator to move the file in a straight line, the surface filed would not be straight, hence files to be used upon flat surfaces should be thickest in the middle and thinner at each end of their lengths. This gives to the surface of the teeth tops a curve or sweep in the length of the file, so that if it should warp slightly in the hardening process the effect is to merely lessen the sweep on one side and increase it on the other. This is of but little consequence, because by altering the height of the respective ends of the file to the work any part of the file may be brought into contact with the work and its action located to any required part of the work. If the file is moved in a straight line it will file flat so long as the surface is curved, but if the file is hollow in its length it cannot under any circumstances file a flat surface, and one of the greatest objections to recut files is that the original curve is not maintained. The most expert mechanic, however, cannot move a file in a straight line, and the curve of the file is usually about sufficient to compensate for the variation of the stroke from a horizontal plane.

The level of the teeth across the file may either be flat or slightly rounding, but in no case should it be hollow, for in that case the two file edges would cut two grooves.

For convex surfaces a flat file is usually employed, but for concave surfaces the file must be given a convexity greater than the concavity of the work, so that any desired part of the file may be brought into contact with the work, notwithstanding a slight irregularity in the curve of the file. A round file should always be a trifle smaller in diameter than the hole it is to be used upon, and before inserting it in the hole the eye should be cast along the length of the file while the latter is revolved slowly in the fingers. By this means we may select the curve in the length of the file, and bring it to bear upon the work so as to avoid filing the edges away.

If we closely examine a flat, square, or half round file we shall find that the cutting edge of the teeth does not come fully up at the corner, hence neither of them will file a clean corner, but leave it slightly round; to remedy this defect the only plan is to grind away the edge of the flat or one side of the square file, making it smooth, or at least so that the teeth points will meet the corner. Care should be taken to select the worst side of the file to grind away, and this will be the side hollowest in its length. Sometimes a smooth half round file is used to square out a corner, in which case the smoother the file the better.

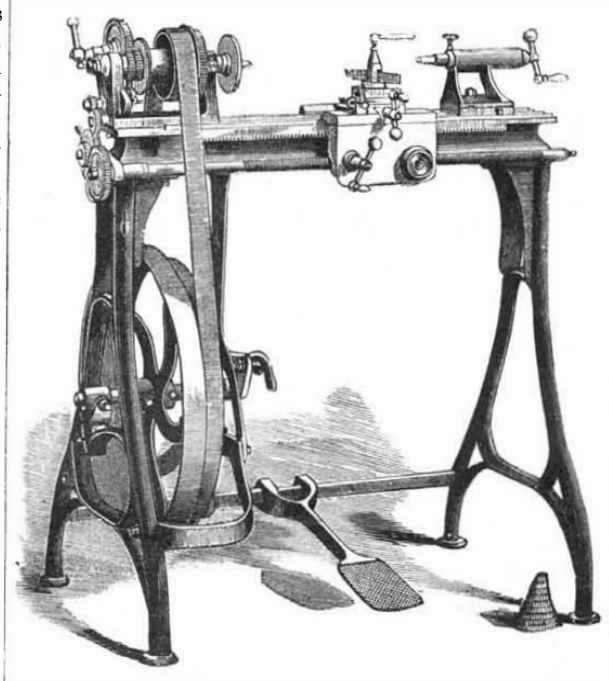
Safe edge files are those which have one edge left without teeth, so that it will not cut, the object being to enable that edge to be moved against a flange or projection of the work without cutting it. As a rule, however, it will be found that cutting the teeth on one side throws a burr over the edge, and it is necessary, unless in very fine files, to pass the safe edge over the grindstone to make it absolutely safe.

In using parallel files for keyways it is often necessary to finish with the end of the file only, so as to take any roundness in the keyway surface. It is to be especially noted that by giving the file a slight lateral motion at each forward stroke and reversing the direction of that motion, so that the file marks cross, there will be less liability for the file to pin and the file will cut more freely, but with a lateral motion from right to left the file cuts cleanest. This is because the deepest serrations forming the file teeth are diagonal and nearest to the end of the file on the left hand side, hence with a motion from right to left there is a partial draw filing action.

For finishing, very light strokes should be taken, the cross filing being done with smooth files before the draw filing is begun, and to prevent pinning a frequent application of chalk should be given to the file teeth.

NEW SCREW CUTTING LATHE.

To meet the demand for a first class and yet low priced screw cutting foot lathe, Messrs. Goodnow & Wightman, of 128 Washington street, Boston, Mass., have perfected the lathe shown in the accompanying engraving.



NEW SCREW CUTTING LATHE.

This lathe occupies a floor space of 25x36 inches, and the centers are 44 inches from the floor. The whole weight is 266 pounds. The bed is 35 inches long, 5 inches deep, and has double Vs for the carriage and tail stock. It swings 8 inches over the bed and 5¾ inches over the carriage, and is 18 inches between centers.

The head stock is back geared, and the cone has two speeds for 1½ inch belt, the smaller being 2½ inches diameter, the larger 5 inches diameter. This with the back gears gives four speeds, the fastest being 1,100 revolutions of the arbor to 100 of the balance wheel, and the slowest 75 revolutions of the arbor to 100 of the balance wheel. This gives sufficient range for all kinds of work.

The arbor in the head stock is 9 inches long, 1¼ inch diameter in the largest part, and has a ⅜ inch hole through it, making it very convenient for turning the ends of long rods, making small screws, studs, etc. There is an attachment in the head stock for reversing the motion of the carriage.

The carriage has a rack and pinion for moving it by hand, and a split nut moved by a cam on the face of the carriage to throw it into engagement with the feed screw. The tool post has a slot for tools ⅜x1⅛ inch. The tools are adjusted by a wedge made on the arc of a circle and fitted to a convex washer. Gears for cutting threads from 8 to 48 accompany the lathe. By compounding the gears other threads may be cut.

The tail stock can be set over for turning tapers. The spindle of the tail stock is $\frac{5}{16}$ inch diameter, and has a motion of 3 inches.

The crank of the foot motion is adjustable, and the shaft has swivel bearings. The balance wheel weighs about 60 pounds, is 21½ inches diameter, and has two speeds to match the cone on the head stock.

For further particulars address Messrs. Goodnow & Wightman as above.

Our Iron Industry.

As supplemental to our article under the above heading, in our issue of June 29, we mention Mr. C. M. Du Puy's direct process of making iron. This process has been indorsed by Messrs. Miller, Metcalf & Parkin, of Pittsburg, Pa. Rich hematites or magnetites are crushed and pulverized, together with carbon and fluxes in the proper proportions, in an ordinary Chilian mill, such as is generally used for grinding the fix. This mixture is then filled into annular cylindrical sheet iron canisters, of No. 26 iron, which are about 16 inches diameter and from 16 to 36 inches high, holding each enough ore to make a cake of metal that will shingle from 100 to 250 lbs. of iron. The carbon used for deoxidation may be either charcoal, coke, or anthracite.

The canisters are placed on end in an ordinary heated reverberatory furnace, on a bed of coke, and placed seven or eight inches apart so as to allow a free circulation of heat. The door is then shut, and without manipulation the work is done. In five or six hours the canisters with their contents have consolidated into masses of metal, saturated with liquid slag, and after being transferred to the squeezer are made into blooms and rolled to muck bar without reheating.

The idea of enveloping ore, with carbon and fluxes properly proportioned, in sheet iron incasements or canisters, originated with Mr. Du Puy, and although partially successful many years ago, it has only been within the past year that quality and yield have been fully satisfactory. As with many other inventions apparently simple, much labor and thought have been required to make it commercially a practical success. We learn that now nearly all the metal can be extracted by it that originally exists in the ore.

Much of the difficulty at first met in perfecting the process was caused by the non-conducting nature of the mixture. Heat penetrates very well through about two and a half or three inches of ore and carbon in about five or six hours; but to penetrate further than this such a high heat and such a protracted time are required as to waste the exterior surface of the metal, lessen the yield, and add largely to the cost of fuel. It was this difficulty that suggested annular canisters, with an opening from top to bottom, through which the heat passes, so that it can penetrate from the inside of the ring of ore and carbon as well as from the outside. This inside space is about six inches in diameter, leaving in canisters of 16 inches outside diameter a ring of mixture five inches in thickness.

With a thorough penetration of the heat, however, success was not yet obtained. It is well known that ordinarily, in direct processes, every pound of silica carries off about three pounds of iron in the slag, since there is no other substance present in sufficient quantity with which to combine. Besides, to reduce iron ore to the metallic state in five or six hours requires a high heat, and this tends to partially reoxidize the iron as soon as it is reduced.

It occurred to the inventor that to dissolve the silica, which is an acid, by the means of alkalies, would serve a double purpose. The silica having a stronger affinity for the alkalies than for the iron, the iron would be saved, and there would also be formed a glazing material, or varnish, to cover and protect the metal from reoxidation. The use of alkalies proved successful, and secured a yield of almost the entire amount of metal contained in the ore.

The chemistry of the process is simple: the oxygen of the ore unites with the carbon and passes off as carbonic oxide, while the alkali combines with the silica and other impurities of the ore to form a glass, which is finally expelled by the pressure of the hammer or squeezer.

It is estimated that a reverberatory furnace, 8 by 14 feet inside dimensions, costing, say, $2,000, will produce over a ton of iron every six hours, or three and a half tons in 24 hours.

The metal has been proved by the analysis of Dr. Otto Wuth, of Pittsburg, to be of great purity, three fourths of the phosphorus existing in the ore being eliminated. The iron, without mixture with any other stock, has also been proved to make the finest steel, and it may be used for all grades of crucible steel, the grade being regulated by varying the carbon in the crucible.

Coming finally to the cost, which is the crucial test of commercial success, it is estimated that the crushing and mixing of the material, together with the cost of the canisters, will be from $6 to $7 to the ton of iron, and that at a like cost of material blooms may be produced at a cost of only $8 to $10 per ton above the cost of pig iron, while the quality will be equal to that of the highest grades of steel stock.

Two Ways of Looking at the Same Facts.

An English scientific paper remarks as a curious physiological fact that although open air life is so favorable to health, yet it has the apparent effect of stunting growth in early youth. While the children of well-to-do parents, carefully housed and tended, are taller for their age than the children of the poor, they are not so strong in after years. "The laborers' children, for instance, who play in the lonely country roads and fields all day, whose parents lock their cottage doors when leaving for work in the morning, so that their offspring shall not gain entrance and do mischief, are almost invariably short for their age. The children of working farmers exhibit the same peculiarity. After sixteen or eighteen, after years of hesitation as it were, the lads shoot up, and become great hulking broad fellows, possessed of immense strength. Hence it would seem that indoor life forces growth at the wrong period, and so injures." The inference is plausible, but is wide of the mark. The children of the well to do are tall not because they are kept indoors, but because they are well fed and saved from severe exposure. The children of the poor are stunted not by too much sun and air, but because they are ill fed. Give the first class plenty of outdoor play, with their proper diet, and they will be strong as well as tall; give to the laborers' children the food suitable to their years, and no amount of sun and wind will stunt them. On the contrary they will not have to wait till age brings capacity to turn strong food to bone and muscle, and time to overcome the evil effects of hard times in early life; but will grow from the first steadily and sturdily.

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New Agricultural Inventions.

Henry H. Hatheway, of Clockville, New York, has patented an improved Machine for Picking Hops from the vines which is simple, convenient, and effective. The machine is operated most advantageously by three persons—one to pull and strip the poles, one to draw the vines through the machine, and one to turn it. It may, however, be operated by two persons, or even by one. In the latter case the vines should be cut into lengths, so that the operator can feed the machine with one hand while he turns it with the other.

An improved Bag Holder has been patented by Joseph Lanham Conway, of Bellefontaine, Missouri. This is a simple and effective holder for holding sacks or bags of various sizes while they are filled. It consists in a frame which is adjustable as to length and breadth, and is provided with spurs for receiving the edges of the mouth of the bag to be filled. The frame is supported by a standard upon which it may be adjusted vertically.

William Carroll Smith, of Jackson, Tenn., has patented an improved Seed Planter, which may be applied to an ordinary plow stock, and which may be used for planting corn and pease in alternate hills, or either separately, and may also be used for planting other seeds.

Jeremiah H. Boyle, of Delhi Mills, Michigan, has patented an improved Vegetable Cutter, which is designed to furnish for farmers, and for other agricultural and domestic purposes, an improved machine for cutting roots and vegetables in a rapid and easy manner, to be used for cooking or feeding purposes, and supply thereby a feed that is more easily masticated by the stock.

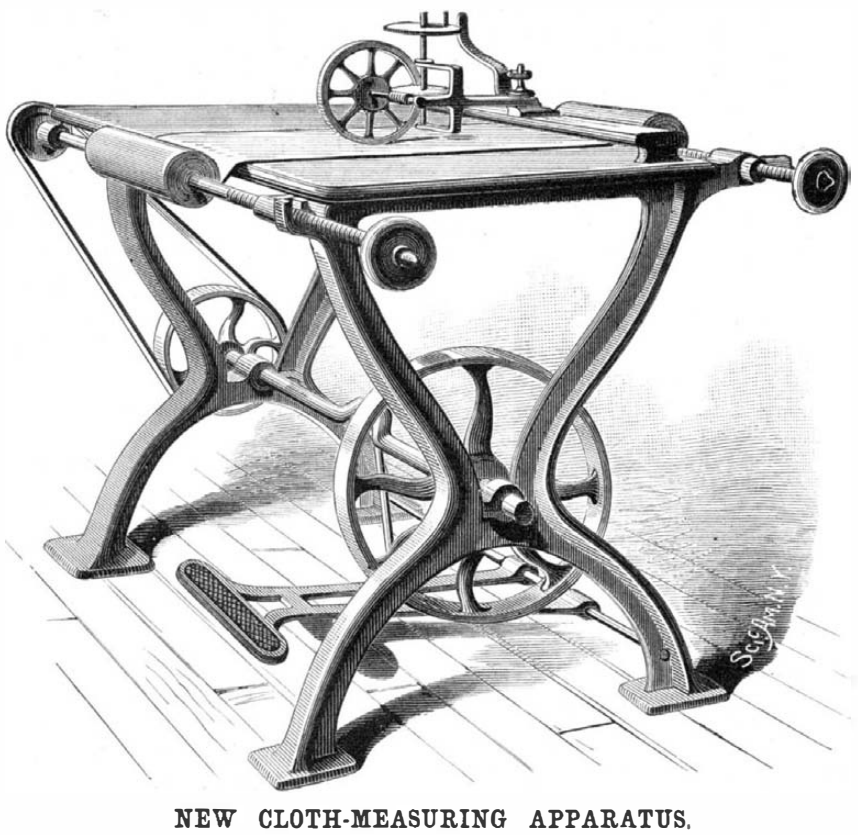
John H. Harter, of Nevada, Ohio, has patented an improved Horse Hay Fork, which is made with a single curved tine, to which is pivoted, a little in the rear of its center, the slotted lower end of a bar or standard. The standard is slightly curved, and upon its upper end is formed an eye to receive a hoisting rope, and to it, in the bottom of the eye, is pivoted a pulley, over which the trip cord passes. The end of the trip cord is secured in an eye formed in the upper end of the bar. The lower end of the bar is pivoted to the rear end of the curved tine. To the opposite sides of the middle part of the trip bar are pivoted the outer ends of two connecting bars, the inner ends of which are pivoted to the opposite sides of the middle part of the standard. With this construction the fork can be folded or closed into a compact form for storage and transportation.

Mathew A. Andrews, of Willsburg, Iowa, has invented an improved Draught Equalizer, which consists in the combination of a stationary cross bar, stay rods or braces, a right angled lever, a connecting rod, and a bent lever, having its outer arm curved into U form with the draw bar. It is stated that this peculiar arrangement of levers and rods forms an effective equalizer for three horses.

Irvin J. Saunders, of Coleman Station, Ga., has patented an improved Plow Stock. The object of this invention is to furnish a simple and strong plow stock conveniently adjustable for varying the pitch of the plow.

NEW CLOTH MEASURING APPARATUS.

Our illustration shows an automatic machine for measuring textile goods, which is in process of introduction by Messrs. White, Child & Co., of College Hill, London. Its action will be readily understood from the engraving. The treadle movement brings the cloth or other fabric across the table and under the measuring wheel, which imparts motion through worm gearing to a dial at the top of the machine. The rate of measurement is about 150 yards per minute, and the fabric is rolled, or, in trade parlance, "blocked," at the same time. Goods of any thickness can be measured by this convenient labor and time saving apparatus, and at stock-taking time it must prove an invaluable aid in drygoods stores.



NEW CLOTH-MEASURING APPARATUS.

Moth Remedies.

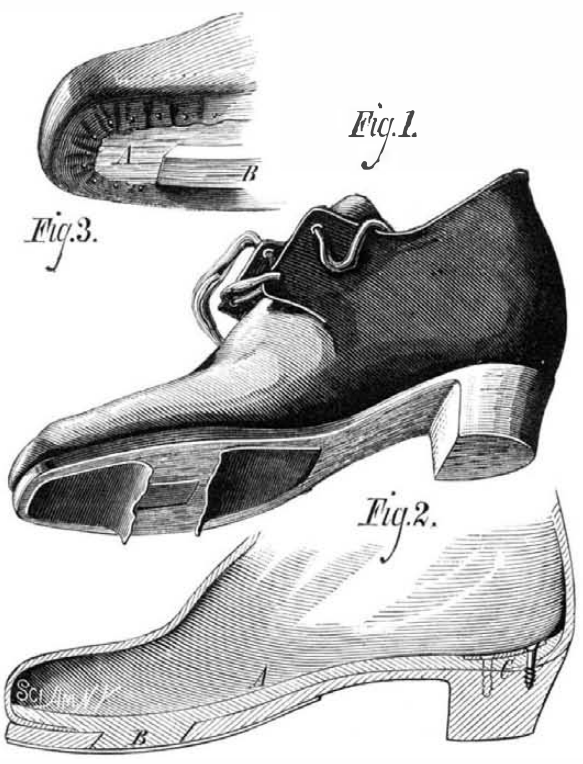
To the question put a short time since by a committee of the German Society of Railway Companies, what means were in use, and had been well tested, for preserving the cushions in railway carriages against moths, forty-three replies have been received by the directors of the Dutch Railway, from which it appears that the following means are employed:

Constant cleaning, airing, and beating of the cushioned carriages (especially in the developing time of moths in the end of May), avoidance of fold in the cloth used, avoidance of a mixture of horsehair with pig's hair, Persian insect powder, insect powder with Spanish pepper or phenyl, camphor, Russian leather, powdered alum, hemp leaves, phenol, pine oil, zinc chloride solution, heating of the cushions in dry air from 70° to 80° C., use of plush instead of woolen cloth, use of seaweed instead of horsehair, avoidance of sheep's wool, occasional use of general compartments as smoking compartments. The directors express themselves to the following effect:

A generally approved means of keeping moths away from the cushions of passenger carriages has not yet been discovered. Frequent airing, beating, and cleaning are useful in this direction; as also, in greater or less degree, a number of the above mentioned substances when applied to the cushion material. After entrance of moths a thorough cleaning of the material is necessary.

GAMPERT'S WOOD-SOLE SHOE.

The invention herewith illustrated consists in a wooden soled shoe in which the sole is made in two parts, between which the edges of the upper are clamped. Said parts are secured by a wedge block formed upon or attached to the insole and by screws. The shoes are, we are informed, easily and conveniently made, and are neat, strong and durable. Fig. 3 shows the inner sole, A, to which the upper is attached; also the wedge block, B. Fig. 2 is a sectional view



GAMPERT'S WOOD-SOLE SHOE.

of both soles, showing the wedge block in place. At C is a metal plate which prevents the screws from splitting the insole. Fig. 1 shows the complete shoe, with a portion of the sole covering removed to exhibit the wedge block.

This device was patented through the Scientific American Patent Agency, May 14, 1878, by Mr. W. Gampert, of Keokuk, Iowa, who may be addressed for further particulars.

Science and Sentiment.

At the anniversary of Founder's Day, which was lately celebrated at the Adelphi Academy Building, Brooklyn, President Noah Porter, of Yale College, spoke as follows on the relations between science and sentiment:

"Much has been said of late concerning a supposed antagonism between science and sentiment, or, as it is often called, sentimentalism. A few examples will best illustrate this antagonism as it is considered by those who accept it. Sentiment, we are told, in the old time encouraged the poor and sick folks to gather about the church doors or lie along the wayside, thinking they might move the pity and receive the alms of their fellow men. Science has taught man to gather them into asylums and hospitals, where healing and relief may be dispensed with wise judiciousness, with neither waste nor fraud, nor with encouragement to idleness and imposture. Sentiment would dictate that a prompt and generous relief should be supplied to all who are in distress, especially if guiltless of crime, and that for such persons almshouses and homes for the friendless should be made comfortable, if not attractive, homes of solace and rest. Science lifts up her voice against lavish and indiscriminate public charity, and refers us to the established principles in relation to the care and management of pauperism and misfortune, which it has matured out of the business experience of many generations. Sentiment would compel two young persons to marry as soon as they take a liking to each other, regardless of age, adaptation, health, or the means of subsistence. Science rudely steps in between them, sternly forbids the bands, and reads a solemn lecture to the parties upon the sin against society and humanity of contracting an early or an improvident marriage. Sentiment asks for unlimited credit and the indefinite deferring of pay day. Science affirms that unless credit is restricted and payment is enforced both lender and borrower will be ruined. Sentiment charms the heart of the people by saying that indefinitely deferred promises to pay by the best government in the world ought to be, and therefore is, the best money in the world. Science cuts short its harangue with the argument that if this were true all the world would be eager to take this money at a premium. Sentiment demands free trade on one side because every man desires to buy in the cheapest market, and protection on the other because home industry ought to be encouraged. Science rejects such argument, and calls the free trader and the protectionist sentimentalists. Sentiment demands that the profits of labor and capital shall be equally divided; but science contends that if the demands of sentiment were allowed there would be scant profits to be divided; that capital would vanish like a mist, and labor would beg for employment upon any terms."

American Coal in Europe.

The United States Consul at Genoa reports that important results are likely to flow from the recent effort of a Philadelphia coal company to introduce American anthracite coal into the non-coal-producing regions of Southern Europe. Two cargoes have been received during the past quarter, and the experiment, which at first threatened failure, has proved a gratifying success. When first put on the market the highest bid was 22 francs ($4.25) per ton—an amount insufficient to cover freightage from New York. On its becoming known that the coal was well adapted for smelting purposes, the price at once advanced to 40 francs ($7.72) per ton, which covers cost and freight, and leaves a fair margin for profits. Heretofore, English coke, selling at 60 francs ($11.58) a ton, has been almost exclusively used by Italian iron founders; but as American anthracite, on trial, yields equally good results, if not better, there is no reason why it should not command the market. Over 200,000 tons of English coke are annually consumed in the Mediterranean basin. For this trade, American anthracite bids fair to become a successful competitor.

An Active Volcano in the Moon.

When examining the surface of the moon, May 27, 1877, Dr. Hermann J. Klein of Köln, noticed what seemed to him to be a new crater on the Mare Vaporum, a little to the northwest of the well known crater of Hyginus. Being deep and dark, and about three miles in diameter, it formed a conspicuous object on the dark gray Mare Vaporum. Having frequently observed this region during the last twelve years, Dr. Klein felt certain that the crater was new. Communicating his observation to Dr. Schmidt, of Athens, he was assured by that veteran selenographer that no such crater appeared in any of his numerous drawings of that part of the lunar surface; nor is it shown by Schroter, Lohrmann, or Mädler, who carefully drew the same region with the fine refractor of Dorpat. In April, 1878, Dr. Klein laid the discovery before the Selenographical Society, and since then the new crater has been observed by several English students of the moon. The Mare Vaporum lies close to the center of the visible surface of the moon, so that objects in this region are very slightly affected by the lunar librations. The region has been closely studied by many, and as it contains several well known craters, some of them less than a mile in diameter, it is evident that the large crater described by Klein is new.

Tic-Douloureux.

A patient who for several years had suffered from an intense neuralgia facialis came under the treatment of Professor Peters, of Paris, who put him under a treatment of six grains of bromide of potassium, the dose repeated thrice daily for the first month, four grains thrice daily in the second month, two grains thrice daily in the third month. The result is reported as being astonishing.

Great success is claimed by Professor Gubler in the use of aconitum napellus for the ordinary form of facial neuralgia, particularly when congestion is present.

Professor Lee, of the "Hôtel Dieu," Paris, relates a case

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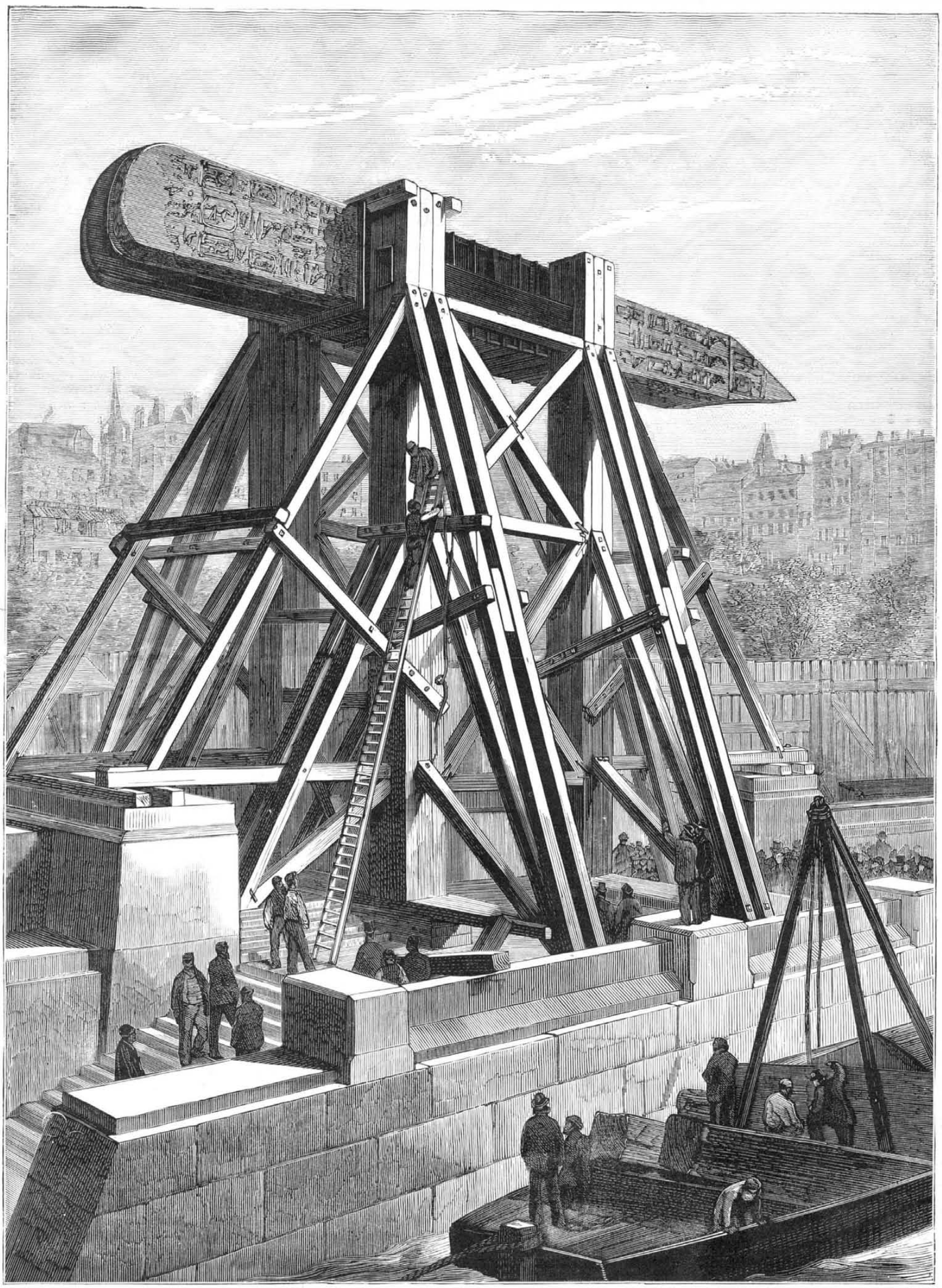
where a patient of his, after thirty years of suffering from the tic-douloureux, got quickly rid of his pain after a few daily administrations of eight-grain doses of salicylate of soda.—*Correspondenz Blatt.*

LANDING OF CLEOPATRA'S NEEDLE.

The difficulties which Mr. Dixon has had to contend with in carrying out his work in connection with the transport of the Egyptian obelisk to England having at last been overcome, the concluding and most difficult part of the undertaking, that of raising and placing the obelisk on its pedestal, is about to be commenced. A timber cradle has been prepared alongside the Adelphi steps, and by the time this paper is published the Cleopatra will probably be safely landed upon it; she is then to be lifted by hydraulic jacks and moved forward at the same time, and afterward a little sidewise, until the stone lies across the center of its pedestal. The iron cylinder vessel, in which the voyage was made, will then be cut to pieces, and twenty feet in length of the center part of the obelisk will be incased in an iron jacket with protruding arms, resembling the trunnions of a monster cannon. These trunnions will rest on two iron girders. A timber scaffolding will then be erected with four uprights, each formed of six balks of timber placed three and three together, the ends of the girders fitting into the spaces between the timbers. Hydraulic jacks will then be placed underneath the girders, and the whole mass gradually lifted, the height gained being secured by solid timber packing. The stone will then exactly represent a monster cannon, and can be swung on its trunnions into a vertical position, and lowered on to its pedestal, which meantime will have been constructed beneath it. Our illustration, which is taken from the London *Graphic*, is drawn from the model to which Mr. Dixon's men are working.

Heat Conductivity.

Experiments lately made by M. Schuhmeister on the heat conductivity of cotton, wool, and silk, by a method similar to that employed by Stefan for determining the conduct-



THE MACHINERY FOR PLACING CLEOPATRA'S NEEDLE IN POSITION ON THE THAMES EMBANKMENT.

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ing power of gases, have led to the following results: The heat conduction of air being considered = 1, that of cotton is (on an average) = 37, sheep's wool = 12, and silk = 11; the cotton and the wool were unwrought. The latter was washed merino wool; the silk was in the state of cocoon fibers.

THE TOTAL ECLIPSE OF THE SUN.

Extensive preparations are being made by the officers in charge of the National Observatory to observe the next total eclipse of the sun, which will take place on the 29th of this month. Congress having voted $8,000 to pay the expenses, the work will not be crippled for lack of funds, and five expeditions have been organized by Admiral Rodgers. The following gives the members of the different parties and their proximate points of observation:

Professor S. Newcomb, Commander W. T. Sampson, Lieut. C. G. Bowman, and John Meier will locate at Creston, Wyoming. This party will photograph with one of the photo-heliographs used in photographing the transit of Venus in December, 1874. They will also observe contacts and look for intra-mercurial planets.

The following party will be stationed at Pueblo, Colorado: Professor A. Hall, Professor J. A. Rogers, Professor A. W. Wright, Mr. H. F. Gardner, and Mr. A. B. Wheeler. They will take photographs of the eclipse, corona, and all around it that can be gotten on a plate; make polariscopic observations of the light of the corona; observe time of contacts, and make a search for intra-mercurial planets.

The next party locates at Creston, Wyoming, and is made up as follows: Professor Wm. Harkness, Lieut. E. W. Sturdy, Assistant Astronomer A. M. Skinner, Messrs. L. E. Walker, A. G. Clark, and Professor O. H. Robinson. This party has the same instructions as Professor Hall's, except that instead of polariscopic observations they will take spectroscopic and thermo-electric observations.

At Pueblo, Colorado, there will also be stationed Professor J. R. Eastman, Professor Lewis Boss, Assistant Astronomer H. M. Paul, and Mr. H. S. Pritchett. This party will take polariscopic observations, observe contacts, search for planets, and make drawings of the corona.

The following party will be at Central City, Colorado: Professor E. S. Holden, Lieut. T. W. Very, and Dr. C. S. Hastings. They will go into the mountains southwest of Denver, search for planets, and investigate structure of corona.

In addition to these main expeditions, Mr. L. Trouvelot, of Cambridge, Mass., a most skillful artist, accompanied by his son, will go to Rawlings, Wyoming, to make a drawing of the corona.

Mr. G. W. Hill, of the Nautical Almanac Office, will be stationed on one of the mountains in Colorado to make drawings of the corona.

Prof. Ormond Stone, of Cincinnati, and Mr. Winslow Upton, of Cambridge, will observe the eclipse from the lofty peaks of Colorado.

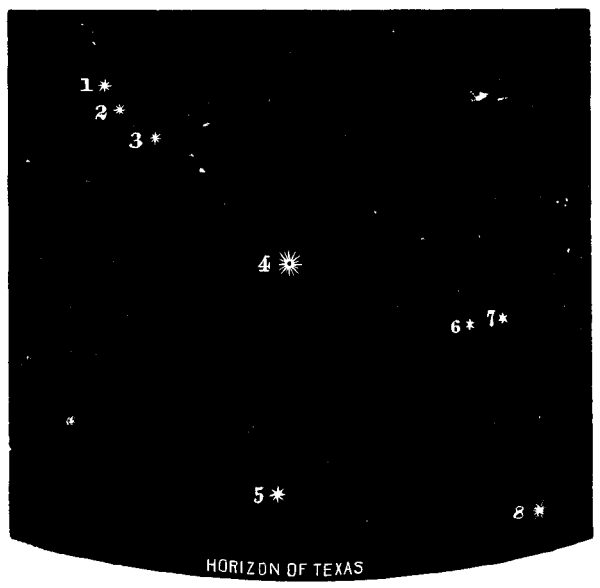
General Myers and Professor Able, of the Signal Office, and Professor Langley, of Pittsburg, will go to Pike's Peak. They will be obliged to take their instruments apart and carry them by hand to an elevation exceeding 14,000 feet.

Mr. D. P. Todd will go to Texas and make arrangements for observing duration of totality near the limits of total eclipse.

Many distinguished English astronomers, and M. Jansen, the famous astronomer from Paris, are coming over to observe the eclipse.

Much interest is attached to the eclipse by our scientists, who look upon it as the means of determining many vexed questions. First, and perhaps the most important, as it is of practical value to all navigators, is the corrections that will be obtained to the present solar and lunar tables. Notwithstanding the remarkable accuracy already obtained, it is to be observed that the location of the central line of the eclipse as calculated by the American Nautical Almanac differs by about four miles from that derived from the English Nautical Almanac.

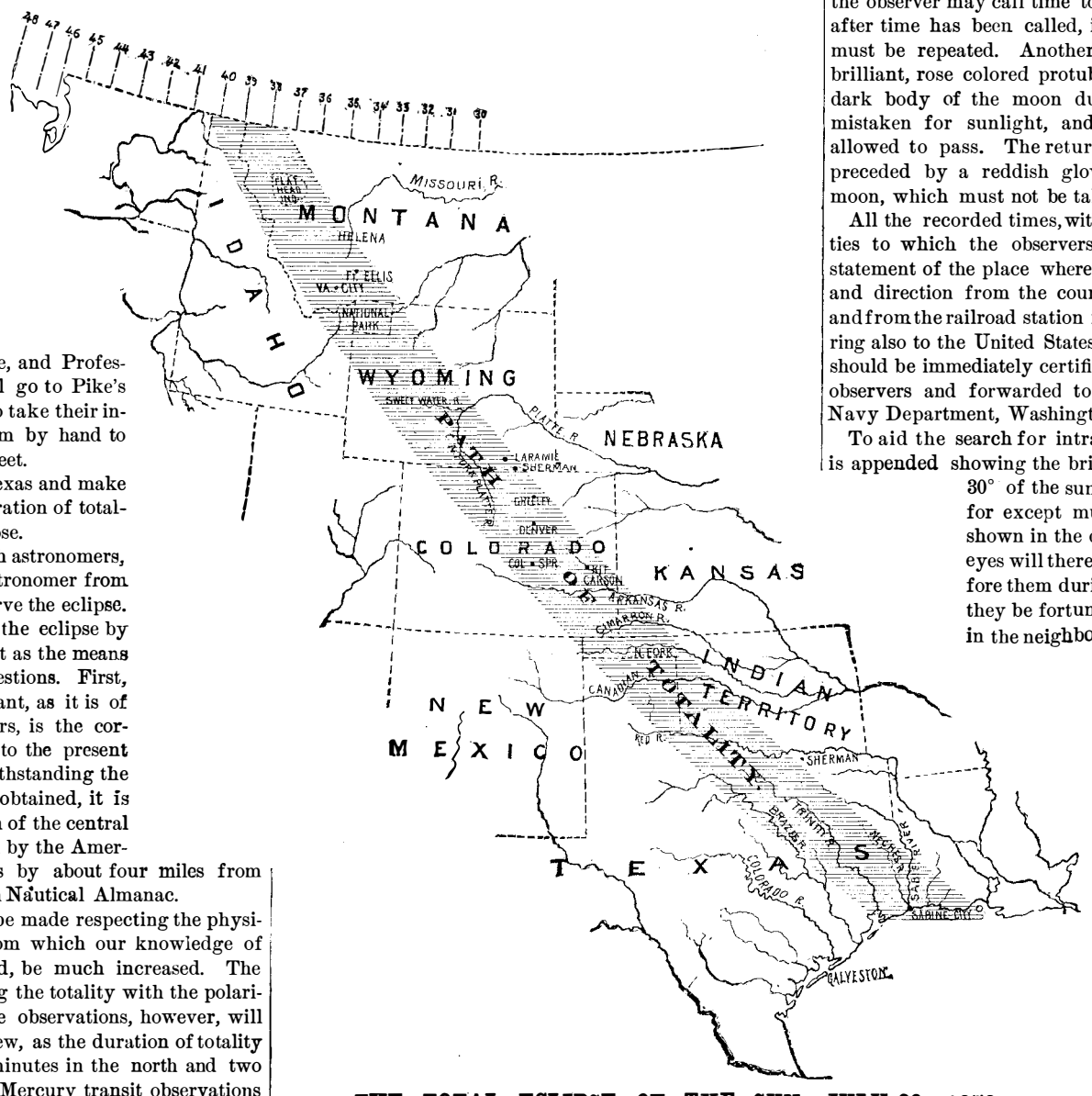
Important observations will be made respecting the physical constitution of the sun, from which our knowledge of that luminary will, it is hoped, be much increased. The corona is to be examined during the totality with the polariscope and spectroscope. These observations, however, will necessarily be comparatively few, as the duration of totality will not be more than three minutes in the north and two and a half in the south. The Mercury transit observations of last May, as far as they have been worked up, appear to demonstrate the fact that the tables of that planet were incorrect, as Le Verrier had said, and as it is thought possible that he might be correct in his supposition of an intra-mercurial planet, advantage of the sun's observation will be taken to examine the heavens in the neighborhood of the sun, for one or more small bodies supposed to belong to our system of planets. In addition to the telescopic scrutiny, large photographs of the heavens will be taken, in order to allow the small planets, if any there be, to print themselves upon the photographic plate and thus announce to the world the fact of their existence and their influence upon the motions of Mercury. Should any of our astronomers be so fortunate as to discover any such body, his name will be heralded throughout the scientific world as ranking with Le Verrier, the discoverer of Neptune, and Hall, the discoverer of the satellites of Mars.



Situation of the Brighter Stars and Planets which may be seen during the Total Eclipse of July 29, 1878.—1. Mercury. 2. Regulus. 3. Mars. 4. The eclipsed sun. 5. Procyon (probably invisible in Texas). 6. Pollux. 7. Castor. 8. Venus (probably invisible in Texas). The sun, and the stars on the left hand side of the map, will be about an hour higher above the horizon in Wyoming than in Texas.

As such a favorable chance for the observation of the various phenomena attending upon a total eclipse can seldom be obtained, Admiral Rodgers and the authorities of the National Observatory wish to make the most of it, and have therefore issued a pamphlet requesting amateur astronomers and others that may be conveniently located to take such observations as may be in their power and forward the results obtained to the Observatory. From this we have condensed the following:

This eclipse may be regarded as a return of that of July 18, 1860. The dark shadow of the moon will first strike the earth in Siberia, and crossing Behring Strait will strike the United States at the line separating Idaho from Montana Territory, will sweep over the western end of the latter, the Yellowstone National Park, diagonally through the center of Wyoming and Colorado, through the Indian Territory, and Northern and Eastern Texas, leaving the United States where Louisiana and Texas join, as illustrated in the accompanying map—the two lines there shown indicating the extreme limits of totality, which will be about 116 miles wide. After leaving the United States the eclipse will pass over most of Cuba and Southern San Domingo. The eclipse will be visible, as a partial one, all over North America.



THE TOTAL ECLIPSE OF THE SUN, JULY 29, 1878.

As previously stated, there is about four miles' difference in the path of the shadow as computed by the American and British Almanacs respectively. Inhabitants of towns near the edge of the shadow may furnish observations by which these limits may be accurately determined by simply noting how many seconds the sun is wholly obscured by the moon. These observations may be most conveniently made by a party of three persons, one being furnished with a watch having a second hand, another with a common spyglass and a piece of smoked glass, and a third with a pencil and note book, to record the time. A station should be selected where the party will be free from all interruption, either in the open air or at an open window. The spyglass should be lashed fast to some fixed object in such a position as to give an easy view of the sun, and some portion of the smoked glass should be very lightly discolored. The watch should have its minute hand carefully set to be on the minute mark when the second hand is on the 60s. It may also be advisable to cover the object glass of the spyglass with a cap having a hole three fourths of an inch in diameter cut in its center to lessen the brilliancy of the sun.

In making the observation, the holder of the watch should, as soon as the visible part of the sun is reduced to its narrowest crescent, begin counting the seconds aloud; the holder of the smoked glass (with or without the spyglass) will watch for the last ray of true sunlight, being careful to look through the brightest part of the glass that the eye will bear without inconvenience; and the third observer will look for the disappearance of the sunlight with the naked eye, and stand ready with pencil and paper to record the time. When the last ray of the sun has disappeared the observer with the glass will call time, and the exact minute and second must then be immediately recorded. The observers will then wait the return of sunlight, which will seem to burst out suddenly, and the minute and second of its appearance must be noted down with the same care as the time of disappearance. The difference of the two times gives the duration of totality.

In judging the beginning of totality there is danger of error if the smoked glass is very dark, because the sun's crescent may become so narrow as to be invisible through the glass several seconds before it is really all covered, and thus the observer may call time too soon. If darkness increases after time has been called, it was called too soon, and it must be repeated. Another danger is that the light of the brilliant, rose colored protuberances which surround the dark body of the moon during the total eclipse may be mistaken for sunlight, and thus the critical moment be allowed to pass. The return of the sunlight will also be preceded by a reddish glow on the border of the dark moon, which must not be taken for the sun.

All the recorded times, with an estimate of the uncertainties to which the observers think they were liable, and a statement of the place where made, giving distance in miles and direction from the courthouse if it be a county town, and from the railroad station if a railroad pass through, referring also to the United States land surveys if there are any, should be immediately certified by the signatures of all three observers and forwarded to the Nautical Almanac Office, Navy Department, Washington, D. C.

To aid the search for intra-mercurial planets, a diagram is appended showing the brightest planets and stars within 30° of the sun. No objects need be looked for except much nearer the sun than those shown in the diagram. Observers with keen eyes will therefore do well to have this map before them during the total eclipse, and should they be fortunate enough to see any objects in the neighborhood of the sun, indicate it by pricking with a pin or pencil the exact spot where such objects appear relatively to those shown on the map. As there may be some difficulty in identifying the various objects, the map should be studied with the aid of the following items: Venus will be in the west about an hour and a half high in Colorado and Wyoming, and only about half an hour in Texas. Procyon will be a little lower than Venus, and further south may not be seen at all. Mercury, Mars, and Regulus will be from an hour and a half to two hours west of the meridian in Colorado and Wyoming, and two hours and a half west in Texas. In the former region they will be southwest from the zenith, and in the latter nearly west, being about one fourth or one third of the way from the zenith to the horizon in each place. Of the three, Mercury will be much the brightest, and may possibly be the only one visible.

Should a spectator observe any object nearer the sun than

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these. he should, before making it on the map, make a careful estimate of its direction and distance relative to them, the distance being estimated as a fraction of that to Pollux or to Mercury, or to the zenith or horizon. All maps thus marked should be sent to the National Observatory at Washington.

Drawings of the corona surrounding the moon during the total eclipse made by such as are expert in sketching will be useful, if made as exact as possible. In doing this it will be necessary to distinguish between the real object and the rays surrounding it, which are the result of an optical illusion. It may be well to have a smoked or colored glass through which to study the object but it should not be too dark, or the details may be hidden.

NEW IRON FENCE.

Our engraving represents a new form of iron fence invented by Freeman R. Martin, of Brooklyn, Greene Co., Wis

The inventor states that the fence is not liable to injury by wind or frost, or by expansion or contraction by changes of temperature.

The posts are made from a bar of round iron, in which are formed three eyes for receiving the hooks that connect the barbed strips, and its lower end is flattened and bent at a right angle to give it a good bearing in the ground, and to prevent it from being raised by frost.

The fence strip is made of thin iron having diagonal slits cut in opposite edges, and the points thus made are bent alternately in opposite directions to form barbs. The double hooks which support the strips pass through the eyes in the posts, and are received in slots near the upper edges of the strips.

This arrangement, in connection with the wings that project from the lower edges of the strips, insures the turning of the strips under a heavy wind, so that the edges only are subjected to pressure.

At suitable distances the strips are provided with expansion joints, shown in Fig. 2, in which the spring keeps the strip taut when it is expanded, and permits of contraction without injury.

This invention was patented through the Scientific American Patent Agency, May 28, 1878.

M. FAYE has lately suggested a new mode of determining a ship's route at sea. namely, by means of the log. With the sextant the angle is taken which the cord of the log makes with the direction of the sun or a star, and thus the ship's direction is determined.

THE ADJUTANT.

This fine bird is notable for the enormous size of the beak, which is capable of seizing and swallowing objects of considerable size—a full-grown cat, a fowl, or a leg of mutton being ingulfed without any apparent difficulty.

The adjutant is a most useful bird in the countries which it inhabits, and it is protected with the utmost care, as it thoroughly cleans the streets of offal which would be left to putrefy but for the constant services of the adjutant and creatures of similar habits.

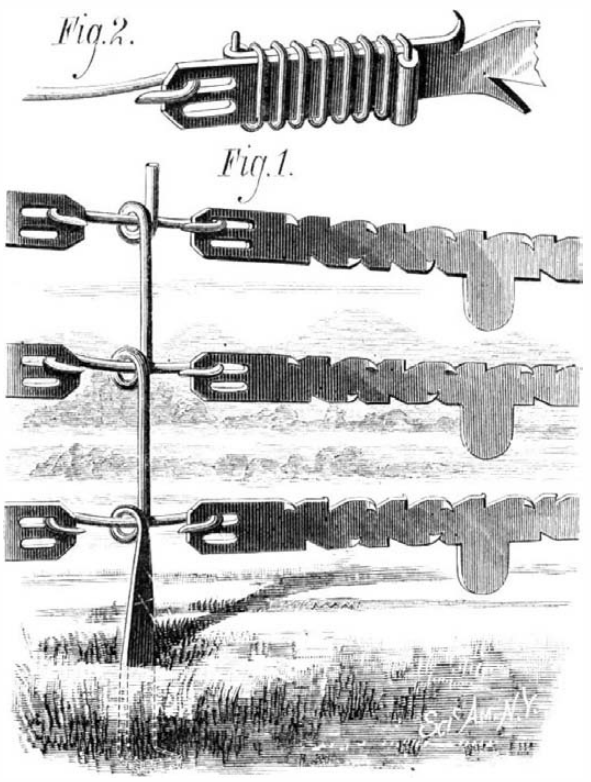
The attitudes assumed by the adjutant are varied and grotesque. It has a curious habit of airing itself on a hot day by standing with its huge beak drooping toward the ground and its wings stuck out straight from the body. Sometimes it squats on the ground with its legs tucked under its body, and sits with an air of dignity. Sometimes it stalks menacingly along, with its neck stretched to the utmost, its head thrust forward, and its huge bill open, looking a most formidable creature; but it is a cowardly bird, as it will run away from a child if boldly faced. It will, however, attack snakes, knocking them over before they can strike, and after battering them to death swallows them whole. During inundations the adjutant follows the course of the rising waters, and makes prey of the reptiles that are driven from their holes.

The capacity of the adjutant's stomach is enormous. It has the power of dissolving the soft and digestible parts and ejecting the indigestible, such as shells and bones. It is easily tamed, but is an incorrigible thief.

The exquisitely fine flowing plumes, the "marabou feathers," are obtained from the adjutant and a kindred species, the marabou of Africa. The general color of the adjutant is a delicate ashen gray above, and white beneath. The great head and proportionately large neck are almost bare of covering, having only a scanty supply of down instead of feathers. From the lower part of the neck hangs a kind of dewlap, which can be inflated at the will of the bird, but it generally hangs loose and flabby. We take our illustration from Wood's "Natural History."

New Inventions.

J. Henry Potter, of East Bridgewater, Mass., has perfected and patented an improved Tremolo, for pipe or reed organs, which consists in a rotary valve placed in a chest connected with the main wind trunk and driven by a wind wheel placed outside of the chest, and supplied with wind from the trunk. It has a regulating valve for controlling the amount of wind supplied to the wind wheel, and a novel device whereby the effect of the tremolo may be delicately shaded so as to produce, with waves of the same length, a slight waver in tone, or the fullest and strongest effect, according to the requirements of the music to be rendered. Any desired effect may be had, varying from the fullest effect of the tremolo to the faintest perceptible undulation, which finally disappears in the plain tone of the pipe or pipes. The tremolo stop may be drawn without affecting the tone of the organ, or the stop may be left in, when the tremolo pedal may be moved without producing the tremolo effect. By this arrangement the swell and tremolo may be operated by the same pedal, and the swell effect will be produced in the tremolo as well as in the general tone of the organ.



MARTIN'S NEW IRON FENCE.

Daniel James MacLean, of Reading, Pa., has devised an improved Toy Bank, by which coins of any denomination or size may be deposited by means of a swinging figure, to the great amusement of children. A larger interior space is furnished than is generally the case in toy banks with figures.

An improved Metallic Horse Collar has been patented by Jesse C. Smith, of Centerville, Iowa. It is made of sheet zinc, pressed into shape, and strengthened with malleable iron stays, so formed as to also serve as a seat for the hames.

Ira Parke, of Mineral Point, Mo., has patented an improved Hive for Bees, which enables bees to be managed by inexperienced persons, and will enable the bee raiser to have his bees swarm or not. It will lessen the labor of the bees in removing refuse; it will admit of removing the best honey, and will resist wind. rain, and cold.

Edward G. Kearsing and Leonzo Kearsing, of Spring Valley, N. Y., have patented an improvement in Dental Gold Fillings. The gold is so prepared that it may be used in heavier masses than is practicable with gold prepared in the ordinary way, thus saving time and labor to the operator by shortening the tedious operation of filling teeth.

Cyrus M. Townsend, of Standing Rock, Dakota Ter., has recently patented an economical Device for Protecting those Surfaces of Leather Gloves, such as are used in husking corn or in any other kind of work, which are most exposed to wear, thereby rendering such gloves more durable than they would be without such protection.

An improved Condensing Vessel has been patented by Edward D. Bangs, of Galesburg, Ill. This invention relates to an improved condensing vessel or apparatus for extracting the entire strength from tea or coffee, and preserving also the aroma and flavor of the same, and for steeping, boiling, or cooking any substances whatever.

An improved Stove, for camp and other uses, that may be reduced to small and compact size for transportation, and readily put up for use, so as to be especially adapted for exploration parties and camp purposes, has been patented by Louis P. Vollbrecht, of Mason, Texas.

Charles Barlow, of Cookshire, Quebec, Canada, is the inventor of an improved Wash Bench, for supporting a wash tub and wringer. It is so constructed that it may be adjusted at different heights, and may be folded into compact form for convenience in storage and transportation.

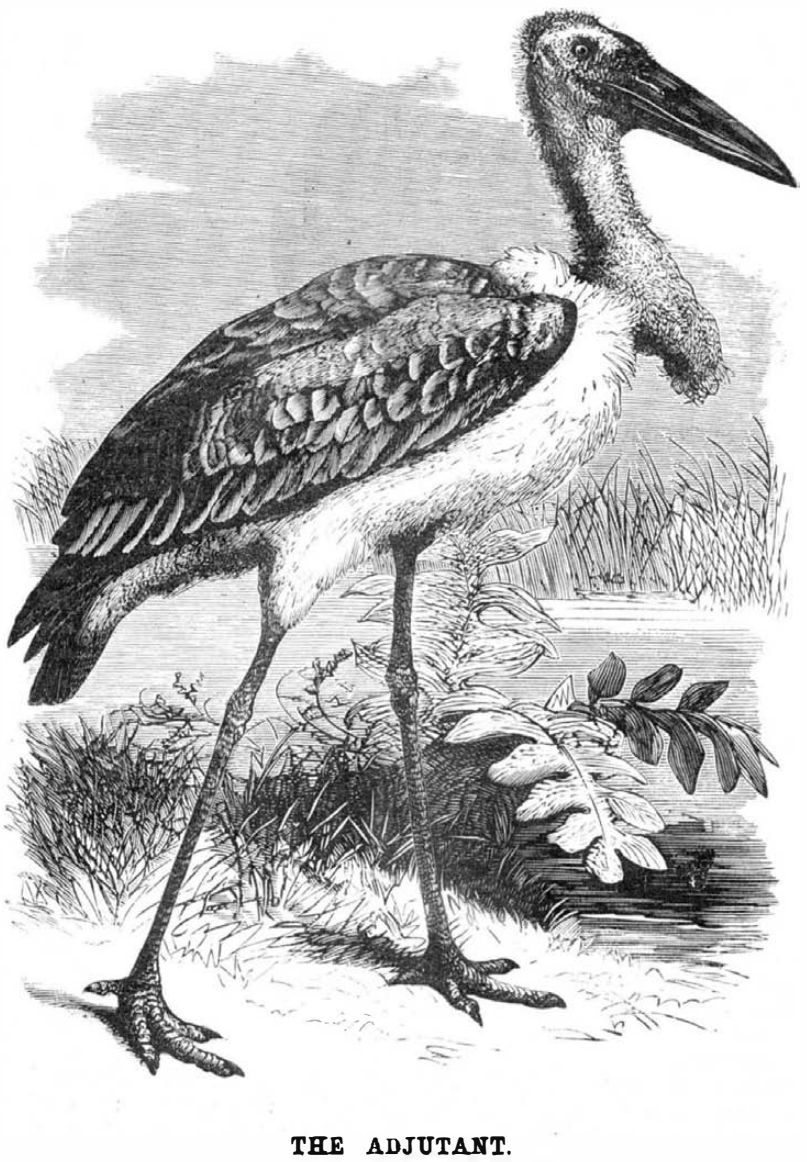
An improved Stove Shelf has recently been patented by Geo. W. Robertson, of Peekskill, N. Y. It is designed to improve and render more convenient the ordinary cooking stove, and it consists in a novel device for attaching a shelf to the end of the stove.

Orson Colvin, of Schoolcraft, Mich., has patented an improvement in Beehives, which relates particularly to the form of the brood chamber and the comb guides or peak blocks secured at the top of said chamber. The lower portion of this improved hive contains the brood chamber, which has arc-shaped or concave sides. Having observed that bees tend to build their brood comb in an oval form, the inventor conceived the idea that a hive having concave sides or sides converging gradually toward the top, and having comb guides arranged at the top of the brood chamber, so as to connect the concave sides and span the space between them, would conform more to the instincts or natural tendencies of the bee, and result in an increased production of surplus honey. He states that upon practical test he found the theory correct, and the yield of surplus honey even greater than was anticipated.

Richard W. Riddle, of Minneapolis, Minn., has patented an improved Earth Closet, which consists in an endless apron carried by a movable frame, which is connected with the seat cover, so that it is moved forward when the cover is closed down, and is moved backward when the cover is raised. It has an arrangement of dogs or cams for clamping the apron and causing it to rotate when moved out or in, thus making two deposits of earth in the excrement receptacle as the seat cover is opened and closed.

An improved Bracelet Fastening has been patented by Leon Van Praag, of New York city, which consists of an elliptical band formed of a strip of spring metal, which may be of any desirable shape or configuration. To one of the ends of the strip of which the bracelet is formed, a concave plate is soldered, so that one half of it projects over the end of the strip. In the projecting portion of the concave plate, near its edge, there is a hole for receiving a hook that projects from the bracelet strip near its plain end. The bracelet is fastened by slipping the plain end under the concave plate, and inserting the hook in the hole. The bracelet may be easily fastened and unfastened by one hand.

An improved Grain Drier has been patented by Peter Provost, of Minneapolis, Minn. This invention relates to apparatus for dry-



THE ADJUTANT.

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ing wheat and other grain preparatory to grinding, and it consists of a drum having a double head in its upper end, and a head and discharge funnel at its lower end, and containing a number of vertical tubes, which run through both of the upper heads and also through the lower head.

George R. Stetson, of New Bedford, Mass., is the inventor of an improved Screw-cutting Die, which consists in a holder formed of a solid piece of metal, having a central aperture for receiving the article to be threaded, and slots for receiving the chasers or thread cutters, and having recesses for containing fastening plates, which engage grooves formed in the sides of the chasers.

Jordan Woods, of Glasgow, Mo., has patented an improved Tobacco Germer, which consists of a cap or shield provided with a projecting metallic nail or cutter, and jointed to a split ring. The device is to be worn on the thumb, and the artificial nail is to be used in the same manner as the natural thumb nail is used in removing germs or suckers from tobacco plants.

Benjamin M. Thomas, of Brooklyn, N. Y., has devised an improved Wrapper, by which needles are inclosed in a neat and convenient manner, the wrapper being readily opened for inspecting the needles without removing them therefrom, and quickly closed again, so that the needles may be conveniently shipped and handled.

An improved Bird Cage has been patented by Edward Weissenborn, of Hoboken, N. J. In this bird cage the upright bars are connected with each other and secured in their proper relative positions without the use of solder, and in such a way that they will be held firmly and securely in place, while at the same time having a neat and substantial appearance.

Wm. S. Hull, of Jackson, Miss., has patented a Flying Toy, which is an improvement upon the aerostat or flying toy for which letters patent were granted him May 8, 1877. The improvement consists in fastening one of the propellers to a tube, and the other to a stem revolving in bearings in said tube, connecting the stem and the tube by a torsional spring to give reverse motion to the propeller, and providing a spring catch mechanism for holding the device in check when wound up, until it is to be given to its flight.

William A. Abbott, of Westfield, Mass., has patented an improved Apparatus for Bundling Cigars, which will enable the work to be done much quicker than when done in the usual way, and produce neater and more uniform bundles. It will enable the bundles to be put up in solid metallic bands, and will give a taper to the ends of the bundles when desired.

Narcisse Pigeon, of Brooklyn, N. Y., has invented a new Process for Manufacturing Glucose, which consists in the following steps: First, slowly heating the corn mash to 185° Fah. or thereabout; second, adding a per cent of malt in the first stage of the process, before the temperature of the mash has reached 125°; third, adding another per cent of malt in the second or last stage of the process, that is to say, after the mash has cooled to 152° or thereabout; fourth, filtering the mash and concentrating the product by evaporation.

John J. Vincent and George B. McMillan, of Poy Sippi, Wis., has patented an improved Music Leaf Turner for pianos and organs, which consists of vertical jointed arms that are turned by separate pinion and sliding rack bar, and connected by spring clamps at the bottom and top of the sheet of music. Each upright arm is locked at the joint by means of a sliding sleeve of the lower clamp, for being retained in upright position or folded down for closing the piano or organ.

An improvement in Drive Well Point Filters has been patented by Martin J. Eich, of Plymouth, Ind. This filter is so constructed as not to interfere with or be injured by driving and turning the points. The filter consists of plates bent longitudinally into triangular form, placed side by side, and having their edges notched and soldered to the perforated tube.

Charles J. Schurheck and Charles A. Stevenson, of New York city, have invented an improved Loom Shuttle, which is provided with tension devices arranged to give a uniform tightness to the thread whatever part of the bobbin it may be unwinding form, and which is easily adjusted to give any desired strain to the thread.

A New Disinfectant.

Under this title, says the *British Medical Journal*, Dr. John Day, of Geelong, Australia, recommends for use in civil and military hospitals, and also for the purpose of destroying the poison germs of small pox, scarlet fever, and other infectious diseases, a disinfectant ingeniously composed of one part of rectified oil of turpentine and seven parts of benzine, with the addition of five drops of oil of verbena to each ounce. Its purifying and disinfecting properties are due to the power which is possessed by each of its ingredients, of absorbing atmospheric oxygen, and converting it into peroxide of hydrogen—a highly active oxidizing agent, and very similar in its nature to ozone. Articles of clothing, furniture, wall paper, carpeting, books, newspapers, letters, etc., may be perfectly saturated with it without receiving the slightest injury; and when it has been once freely applied to any rough or porous surface, its action will be persistent for an almost indefinite period. This may, at any time, be readily shown by pouring a few drops of a solution of iodide of potassium over the material which has been disinfected, when the peroxide of hydrogen which is being continually generated within it will quickly liberate the iodine from its combination with the potassium, and give rise to dark brown stains.

ASTRONOMICAL NOTES.

BY BERLIN H. WRIGHT.

PENN YAN, N. Y., Saturday, July 27, 1878.

The following calculations are adapted to the latitude of New York city, and are expressed in true or clock time, being for the date given in the caption when not otherwise stated.

PLANETS.

	H.M.		H.M.
Venus rises	2 27 mo.	Saturn rises	9 53 eve.
Mars sets	8 11 eve.	Saturn in meridian	3 54 mo.
Jupiter rises	7 09 eve.	Uranus sets	8 26 eve.
Jupiter in meridian	11 45 eve.	Neptune rises	11 22 eve.

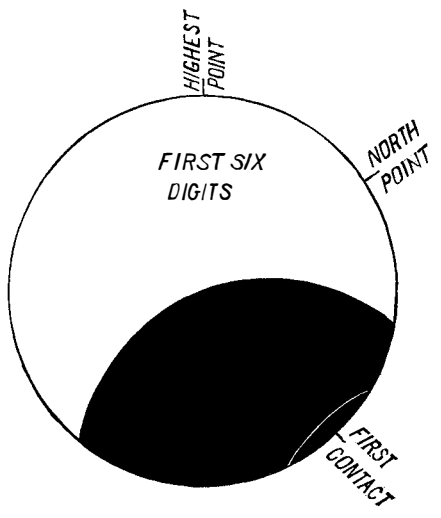
FIRST MAGNITUDE STARS.

	H.M.		H.M.
Alpheratz rises	7 49 eve.	Regulus sets	8 24 eve.
Algol (var.) rises	9 29 eve.	Spica in meridian	4 57 eve.
7 stars (Pleiades) rise	11 48 eve.	Arcturus in meridian	5 48 eve.
Aldebaran rises	1 12 mo.	Antares in meridian	8 00 eve.
Capella rises	10 35 eve.	Vega in meridian	10 10 eve.
Rigel rises	3 18 mo.	Altair in meridian	11 22 eve.
Betelgeuse rises	3 04 mo.	Deneb in meridian	0 18 mo.
Sirius	invisible.	Fomalhaut rises	10 29 eve.
Procyon	invisible.		

REMARKS.

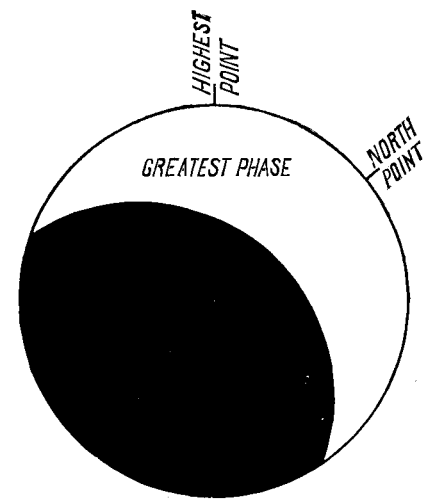
Venus is near the moon this date at 4h. 9m. A.M., being about 5° south. Mars is near the moon July 30, being about 2° north. Jupiter is in opposition, that is, 180° east or west of the sun, July 25.

The following engravings of the phases of the eclipse,

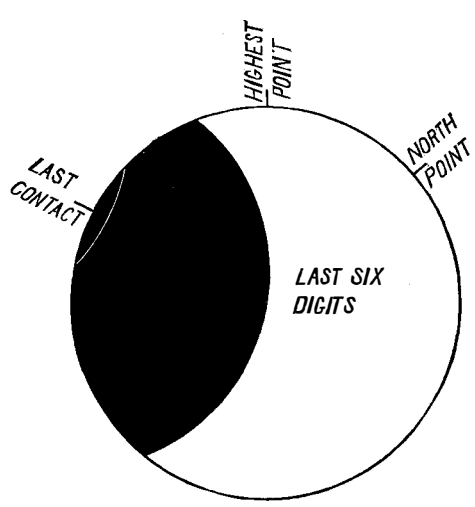


July 29, represent the general appearance in the Middle and Northern States.

The sun will be totally eclipsed July 29, in the afternoon, and will be visible generally throughout the United States as a partial eclipse. The line of central eclipse—the region



over which the center of the shadow passes—begins in central Asia, Lat. 55° N., Long. 165° W. of Washington, and crosses Behring Strait into Alaska at 65° N. Lat., taking a southeasterly course through British America and the United States. The total phase will be observed from various points along the route of the Union Pacific Railroad. Sherman



station and Ogden have been selected as points of observation because of their great elevation, thus avoiding the denser portion of the atmosphere. By this means the distinguishing properties of instruments is increased, and consequently a much higher power can be used than would otherwise be possible and give good results. Near Denver the total occurs at 3h. 27m. P.M., local mean time, with a magnitude of 12·1 digits. The line of totality leaves the United States near Galveston, where a total phase occurs at 4h. 30m. P.M., local mean time, passing across the Gulf of Mexico and the western extremity of Cuba, giving a total phase at Havana at 5h. 34m. P.M., ending in the Caribbean Sea just off the southeast shore of the island of St. Domingo, where the total occurs at sunset. At New York city the eclipse begins at 4h. 42m. P.M.; middle, 5h. 35m. P.M.; end, 6h. 28m. P.M. Size 7·8 digits upon the sun's southern limb.

THE CURIOSITIES OF TOBACCO.

The passion for rare collections is curiously exemplified in the instance of a gentleman residing in Birmingham, England, who has traveled extensively, and has for years devoted much time and money in obtaining from every part of the world all kinds of tobacco and preparations of tobacco, pipes of every nation and tribe, snuff boxes and bottles, and a large library—shelves and floors piled up with books—containing all that has been written and published in favor of or against the use of the weed, from King James' "Counterblast" to Trask's pamphlets, and whatever else there may be. The variety of his acquisitions is constantly increasing, until now his collection is not only of great intrinsic value, but a wonder and delight to those possessing taste for rare and exquisite work and curious designs. There is scarcely a tribe in Africa or America or a solitary island of the ocean that has not contributed something of its handiwork to this collection in the shape of pipes—demonstrating the temporal consolation and refuge of men—some of them of strange, uncouth shapes and workmanship, and others giving evidence of good advance in artistic taste and skill.

Those from China and Japan, however (including opium pipes), with their profuse and exquisite ornamentation in gold, silver, and enamel, are the gems of this part of the collection; while of every style of earthen pipe, from the first rude clay to the finest and most beautifully decorated porcelain, his cabinet contains one or more specimens, by which is indicated, as well perhaps as by a collection of old china and porcelain, the progress of the ceramic art.

But the most beautiful and costly of his treasures are the superb antique snuff bottles, numbering several hundreds, mostly of Chinese and Japanese manufacture, and in form generally a flattened oval of from 1½ to 2 inches across, and from 2½ to 3½ inches long, with caps or stoppers having a small spoon attached with which to withdraw the snuff and apply it to the nostrils.

Those of gold and silver, though in many instances wrought with all the fancy and skill imaginable, are of less intrinsic or artistic value than are many of the others. Here are some of carved jadestone, others of carnelian, others of beautiful agates, and next one of the larger size fashioned from a single sapphire; and here are several of the purest rock crystal, cut and polished as clearly on the inside as on the outside; but the jewels of the collection are those of opaque glass, made apparently by the imposition of a layer of one brilliant color over another—in some cases there are three or more layers—and ornamented with designs cut through to the innermost one, after the manner of cameo cutting.

In most instances these bottles bear dates and monograms, which enable one who has thoroughly studied them, as has this gentleman, to trace the progress of the art through centuries.

It is impossible in this article to give more than an idea of this collection, but its owner is preparing a descriptive and illustrated catalogue of it, the drawings and coloring being done by students of the Sheffield School of Design, of which he was founder and president, which will be in itself a work of art and a valuable addition to any library.

PRESERVING FISH BY HYDRAULIC PRESSURE.

According to the *Fishing Gazette*, Mr. Johnnes Eckart, of Munich, claims to have discovered a method of keeping fish perfectly fresh for many days after capture. His plan of procedure consists in impregnating them, by means of hydraulic pressure, with a weak solution of salicylic acid, packing them in casks or cases, and pouring gelatine over them. The latter serves to prevent them from becoming stiff and dry. Prepared and packed in this manner they may, it is said, remain from ten to fifteen days, and even longer, *en route*, without detriment to their flavor or appearance. Mr. Roosen, of Hamburg, who is turning this new system of preservation to practical account, has received the most satisfactory reports respecting his consignments of fresh and salt water fish to distant countries. Trout caught near Munich, and treated according to Eckart's plan, arrived, it appears, at Bergen, in Norway, and in New York in a perfectly fresh state; and sea fish dispatched from Ring kjöbing, in Denmark, to Dresden, Leipsic, and other inland German towns, have found such favor as to encourage several Consumvereine to give orders for weekly deliveries. Sample consignments have also been made to England, and Mr. Roosen proposes to arrange for regularly supplying the London market. As one of Eckart's patent impregnating machines, large enough to hold 400 pounds of fish, will prepare some 8,000 pounds a day, a considerable amount of piscine produce can thus be quickly preserved for dispatch to any destination; and, since ice is altogether dispensed with, and no necessity exists for sending the fish by fast trains, the cost of transport is of course greatly reduced.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Lubricene.—A Lubricating Material in the form of a Grease. One pound equal to two gallons of sperm oil. R. J. Chard, New York.

Situation Wanted by a Machinist and Engineer, experienced as foreman. Address Draughtsman, 547 Lafayette Ave., Brooklyn, N. Y.

Self-feeding Upright Drilling Machine of superior construction; drills holes from ⅛ to ¾ inch diameter. Pratt & Whitney Co., Manfrs., Hartford, Conn.

Holly System of Water Supply and Fire Protection for Cities and Villages. See advertisement in Scientific American of last week.

Diamond Self-clamp Paper Cutter and Bookbinders' Machinery. Howard Iron Works, Buffalo, N. Y.

For Sale—One Large Circular Saw Mill; will saw logs 75 feet long. Very Heavy Iron Frame. Sell Cheap. E. P. Bullard, 14 Dey street, New York.

Bound Volumes of the Scientific American.—I will sell bound volumes 4, 10, 11, 12, 13, 16, 28, and 32, New Series, for $1 each, to be sent by express. Address John Edwards, P. O. Box 773, New York.

Special Planers for Jointing and Surfacing, Band and Scroll Saws, Universal Wood-workers, etc., manufactured by Bentel, Margedant & Co. Hamilton, Ohio.

Water Wheels, increased power. O.J. Bollinger, York, Pa.

We make steel castings from ¼ to 10,000 lbs. weight 3 times as strong as cast iron. 12,000 Crank Shafts of this steel now running and proved superior to wrought iron. Circulars and price list free. Address Chester Steel Castings Co., Evelina St., Philadelphia, Pa.

Diamond Drills, J. Dickinson, 64 Nassau St., N. Y.

Sperm Oil, Pure. Wm. F. Nye, New Bedford, Mass.

Power & Foot Presses, Ferracute Co., Bridgeton, N. J.

North's Lathe Dog. 347 N. 4th St., Philadelphia, Pa.

Friction Clutches for heavy work. Can be run at high speeds, and start gradual. Safety Elevators and Hoisting Machinery a specialty. D. Frisbie & Co., New Haven, Ct.

Machine Cut Brass Gear Wheels for Models, etc. (new list). Models, experimental work, and machine work generally. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Emery in Bbls. and Cans, all numbers, at lowest rates. Greene, Tweed & Co., 18 Park Place, N. Y.

To Steam Users, Engineers, Boiler Makers and Inspectors. Send for book with valuable information. The use of coal with economy; horse power of engines and boilers; safe pressure; grate and heating surface; coal and water required per horse power. Price 25 cents. Lovegrove & Co., Philadelphia, Pa.

The Turbine Wheel made by Risdon & Co., Mt. Holly, N.J., gave the best results at Centennial tets.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St. Wm. Sellers & Co.

Wm. Sellers & Co., Phila., have introduced a new Injector, worked by a single motion of a lever.

Kreider, Campbell & Co., 1030 Germantown Ave., Phila., Pa., contractors for mills for all kinds of grinding.

The only Engine in the market attached to boiler having cold bearings. F.F. & A.B. Landis, Lancaster, Pa.

Bolt Forging Machine & Power Hammers a specialty. Send for circulars. Forsaith & Co., Manchester, N. H.

Best Steam Pipe & Boiler Covering. P. Carey, Dayton, O.

Foot Lathes, Fret Saws, 6c., 90 pp. E. Brown, Lowell, Ms.

Punching Presses, Drop Hammers, and Dies for working Metals, etc. The Stiles & Parker Press Co., Middletown, Conn.

"The Best Mill in the World," for White Lead, Dry, Paste, or Mixed Paint, Printing Ink, Chocolate, Paris White, Shoe Blacking, etc., Flour, Meal, Feed, Drugs, Cork, etc. Charles Ross, Jr., Williamsburgh, N. Y.

Improved Wood-working Machinery made by Walker Bros., 73 and 75 Laurel St., Philadelphia, Pa.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

For Heavy Punches, Shears, Boiler Shop Rolls, Radial Drills, etc., send to Hilles & Jones, Wilmington, Del.

2d hand Planers, 7′ x 30″, $300; 6′ x 24″, $225; 5′ x 24″, $200; sc. cutt. b'k g'd Lathe, 9′ x 28″, $200; A.C. Stebbins, Worcester, Mass.

Blake's Belt Studs. The best fastening for Leather and Rubber Belting. Greene, Tweed & Co.

J. C. Hoadley, Consulting Engineer and Mechanical and Scientific Expert, Lawrence, Mass.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing metals. E. Lyon & Co., 470 Grand St., N. Y.

For Town and Village use, comb'd Hand Fire Engine & Hose Carriage, $350. Forsaith & Co., Manchester, N. H.

Nickel Plating.—A white deposit guaranteed by using our material. Condit, Hanson & Van Winkle, Newark, N.J.

Cheap but Good. The "Roberts Engine," see cut in this paper, June 1st, 1878. Alse horizontal and vertical engines and boilers. E. E. Roberts, 107 Liberty St., N. Y.

The Cameron Steam Pump mounted in Phosphor Bronze is an indestructible machine. See ad. back page.

1,000 2d hand machines for sale Send stamp for descriptive price list. Forsaith & Co., Manchester, N. H.

Improved Steel Castings; stiff and durable; as soft and easily worked as wrought iron; tensile strength not less than 65,000 lbs. to sq. in. Circulars free. Pittsburgh Steel Casting Company, Pittsburgh, Pa.

Presses, Dies, and Tools for working Sheet Metals, etc. Fruit and other Can Tools. Bliss & Williams, Brooklyn, N. Y., and Paris Exposition, 1878.

Notes & Queries

(1) L. S. S. asks for a recipe for a good sympathetic ink. A. See reply to W. P., No. 25 of last volume of SCIENTIFIC AMERICAN.

(2) W. S. A. asks: 1. Whether the coil for a telephone or an electro-magnet must be wound evenly in parallel layers, or would it do as well if wound haphazard, or in any way approximating to layers? A. The coil should be wound evenly. 2. How to magnetize two steel bars, each 4¾ inches long x ⅜ inch diameter? A. See reply to H. R., No. 2 of current volume. 3. What battery power is needed in the form of a gravity battery? A. 8 or 10. 4. Must the batteries be connected for intensity or quantity? A. Quantity. 5. Must the two magnets of a pair of telephones be of equal strength? A. The results are better when the two magnets are of equal strength.

(3) P. L. C. writes: I wish to know what is the best preparation of paint or solution to put on tin, galvanized iron, or common sheet iron, where it is kept constantly in water, sometimes hot water? A. Several coats of genuine asphaltum varnish, each permitted to thoroughly harden before applying the next, ordinarily suffice.

Will India rubber dissolve and mix in with boiled linseed oil? A. Yes; gently heat the oil, and stir until the caoutchouc is softened and diffused through it.

(4) N. C. L. writes: Twice I have seen a scrap of paper thrown on the ground, after a few moments, catch fire, somewhat mysteriously to me, although I think the parties who threw it must have put it to some chemical treatment. A. Saturate the paper with a solution of phosphorus in ethylic ether or carbon disulphide. The solvent on evaporation leaves the phosphorus in a finely divided condition and spontaneously inflammable.

(5) C. B. asks (1) for the best material for a gas balloon about 4 feet diameter. Would cotton upon which rubber is deposited answer? A. Silk is most suitable, but light fine muslin is often used. 2. How can I cover cotton with a thin coating of India rubber? A. Digest caoutchouc in 30 parts of benzole in a warm place and in a well closed vessel. Apply with a brush.

(6) C. W. H. asks: What are the best ingredients for preventing ink and mucilage from souring and moulding? A. A few drops of carbolic acid and clove oil to each pint bottle are usually all that is requisite.

(7) C. M. K. asks for a composition to cover a pipe with that will make it fireproof at about 3000°. A. If we understand you, we know of nothing.

At what degree of heat will lava melt, such as used for tips in gas burners? A. It has not been determined, we think.

(8) F. C. C. asks: How can I test coal oil? A. Place a small sample of the oil to be tested in a cup partially immersed in a vessel of water, and having placed the bulb of a good thermometer in the oil, heat the water gradually, and as the temperature of the oil rises apply the flame of a burning taper to its surface, and note on the thermometer the degree at which it inflames. This should not occur below 120° Fah. Many of the standard oils inflame only at temperatures of 150° or higher.

(9) N. P. S. writes: 1. I have an emery wheel that has accidentally become saturated with sweet oil. It is as smooth as glass, it does not cut at all. How can it be cleaned? A. If the emery wheel is made of materials that are insoluble in benzine, you might soak it for a few hours in benzine. 2. In using compressed air as motive power for a small wheel or fan of high speed (say 1,500 revolutions per minute) is there anything gained by inclosing it and employing the air on the same principle as water for a turbine water wheel? A. No. 3. If not, at what angle is the best to let the air strike the fan? A. 70°.

(10) J. W. asks: What is the process for silvering the inside of glass globes or the inside of bottles? A. SCIENTIFIC AMERICAN SUPPLEMENT No. 105 describes several processes.

(11) S. G. P. asks if it would lessen the danger of kerosene explosions by filling the lamp partly with water. A. No.

(12) J. C. asks: 1. Is there any simple test by which a layman may ascertain if his well water is injuriously affected by the lead pipe pump connection? A. Evaporate by gentle heat a small sample of the water nearly to dryness in a clean porcelain cup, moisten the residue with acetic acid, and add to a portion of it a few drops of strong hydrosulphuric acid—pure water saturated with the gas evolved by the action of dilute sulphuric acid on iron mono-sulphide: a black precipitate indicates lead. Add to another portion of the dilute acetic acid solution a little pure hydrochloric acid: a white precipitate, which redissolves on diluting with boiling water, indicates lead. To the remainder of the solution add a few drops of dilute sulphuric acid and let it stand for a time: a white heavy precipitate indicates lead. 2. It would be difficult to examine the pipe. The well is covered up and cemented airtight. Is that any objection? A. If there is a possibility of an accumulation of noxious gases in the well it should be ventilated.

(13) A. McN. asks: Are tomatoes injurious when eaten freely? A. No.

(14) F. P. B. asks for a mixture capable of producing a spark when struck by steel. A. A minute quantity of the fulminate of mercury will answer. It is prepared as follows: 1 drachm of mercury is dissolved by aid of gentle heat in ½ oz. (measured) of nitric acid, of specific gravity 1·4, and the solution then poured into ¾ oz. of alcohol (specific gravity = 0·83); action soon ensues with the evolution of copious white fumes, and the fulminate is deposited at the bottom. This is carefully washed with cold water and dried at a very gentle heat. It explodes by friction or percussion, or when heated above 380° Fah. Sealed in small grains between slips of paper with a little waterproof cement it may be kept for any length of time. This is an exceedingly dangerous substance to handle.

(15) H. J. S. asks for a fine blacking recipe. A. See reply to query No. 10, in No. 1 of current volume.

(16) J. G. R. writes: 1. I wish to make the battery described in "Science Record" for 1876, p. 221, called the Coke manganese galvanic cell. Please tell me what size box will I need and what shape for the Coke manganese cylinder described? A. 4 inches square and 6 inches deep. 2. Will common brown straw wrapping paper do to make cylinders in? A. Yes. 3. Are the paper wrappers to be left on when I set up the battery? A. Yes. 4. Can I use common tinman's zinc (that is, thin rolled zinc) for the negative pole? A. Yes. 5. Will it give as much power as thicker zinc as long as it lasts? A. Yes. 6. With three such cells will I get more power than from the same size and number of sulphate of copper gravity battery? A. Yes.

(17) J. L. inquires as to the best method of hardening iron links for locomotives. We cannot use the recipe in "Wrinkles and Recipes" of hardening in iron box with bones, owing to not having proper furnace accommodation. Can you advise any other good method? A. Heat the link to redness, and spread upon it pulverized prussiate of potash until the latter fuses, then reheat the link to a blood red, and immerse it in cold water until cooled.

(18) G. M. L. asks: Why is it necessary to use carbon points in electric lights? A. It is the only substance yet discovered which will produce the effect. Your second question cannot be answered in these columns.

(19) A. N. C. writes: 1. In connecting telephones with the wrong pole of the battery it spoils the magnets. Will you please tell me how to determine which pole to put them on? A. If the helix is applied to the north pole of the magnet the wire should be wound in a left hand direction, and the current should traverse the helix (from + to —) in a direction that would be left handed when we look at the north pole of the magnet. If the helix is placed on the south pole of the magnet the helix should be oppositely arranged. 2. Is it infringing on the Bell patent to use a plate made of paper? A. Yes. 3. Can a telephone made with a skin and a piece of twine be used to transmit sound from the Bell telephone? A. It is said to have been done.

(20) H. W. G. writes: Will you please inform us what is the utmost horse power of a locomotive, with cylinders 16″ x 24″, drivers 5 feet, running 30 miles per hour, boiler pressure 130 lbs., boiler 40″, 144 flues 2″, 11′ long, firebox 2′ 10″ x 5′ 6″? A. Horse power = (2×area of one piston in square inches×speed of piston in feet per minute × mean pressure of steam throughout stroke in lbs. per square inch) ÷ 33,000. You can readily substitute the proper quantities in this formula, and solve.

(21) A. H. G. asks: 1. Which boiler will steam the best, flue or tubular? A. There is not a great deal of difference between well proportioned boilers of the two classes. 2. Where the boiler is quite short, would you advise many tubes and large diameter of shell to make up for lack of length, or several flues of moderate size with large diameter of shell? A. The former, in general.

(22) S. writes: Mr. Bourne, in his work on the steam engine and cognate subjects, says that the resistance overcome in well shaped vessels going through the water is composed mainly of the friction of the bottom of the vessel against the water, and very little by the moving aside of the water by the vessel's bow. I ask why should not the friction of the vessel's sides count for something as well as that of the bottom? A. We do not understand that Mr. Bourne attributes all the resistance to skin friction, but that he desires to call attention to its great preponderance, and his remark about best form probably refers to a form in which the requisite displacement is obtained with a minimum of immersed surface.

(23) J. M. K. writes: Will some printer tell me how many lbs. of pica type will print four pages 10 x 15 inches? A. The amount of pica type required for four pages 10 x 15 would be about 200 lbs., as it requires over 46 lbs. for a page, and the cases can never be set entirely clear.

(24) D. L. G. asks: 1. What is the difference in process of manufacturing malleable cast iron, from that of manufacturing common cast iron? A. Malleable cast iron is cast iron rendered partly malleable by annealing. The casting is first made of the desired form, and then annealed by being heated in an air tight box, and allowed to cool slowly. 2. Where can I get malleable casting done? A. Consult our advertising columns.

(25) S. L. G. asks: 1. Can we conduct water ⅝ of a mile through a ¼ inch pipe, where a part of the pipe will be higher than the source of supply? A. Yes, but the pipe must be laid with great care, and supplied with air valves. 2. Can two siphons be united where the source of one is higher than the other? A. Yes. 3. Should the junction be made at the highest or lowest point? A. We do not think it is a matter of great importance which point is used. 4. How much power could we get from a stream of water 2 inches square at the source, with a fall of 15 feet in ⅝ of a mile? Would it be one man power? A. The horse power of the water would be

$$\frac{\text{lbs. of water discharged per minute} \times \text{height of fall}}{33{,}000}$$

(26) D. S. F. asks: Which has the greatest propelling power, a wheel of 3 feet in diameter with a journal through the center and let run on two rails (one on each side) down an inclined plane, or one of 6 feet in diameter of the same weight, and with the same sized journal through the center, and let run down the same inclined plane, both run the same distance, and will there be any difference in the speed and force attained in running a certain distance? A. The difference will ordinarily be in favor of the large wheels.

(27) J. E. P. asks if three cells about 2½ gallons each of a gravity battery are sufficient to nickel plate small articles with. A. Yes.

(28) G. S. H. writes: I want to take up an elm tree about 8 inches diameter at the butt, and transplant it (I will have to carry it about 1 mile). I want to save all the top. Can I move it any season of the year, and how? How shall I prepare the ground to receive it? A. It is doubtful if an elm tree of that size can be transplanted without "cutting back" the top somewhat. Unless the top is cut back the tree will never have the vigor it possessed before removal. It is preferable to move early in the spring. The earth to receive it should be a soft rich material, and kept moist until the dry season is over.

How can I get rid of ants and roaches? I mean keep them away. A. See reply to J. H. K., in No. 2 of current volume.

(29) W. W. C. writes: Powder being ignited in an airtight vessel which it is not strong enough to burst, how long would it retain its power? A. If combustion occurred, the products would probably retain their pressure until released.

What is the relative height and depth of the waves and trough of the sea, or is the height of the waves measured from the bottom of the trough of the sea? A. It is measured in the last named manner.

Does a short armed man have any advantage over a man with a long arm? A. Other things being equal he probably does.

(30) J. S. writes: There is a contention over a cut gear, between myself and the rest of the boys, and we have come to the conclusion to refer the matter to you for settlement. I claim that a gear 3½″ in diameter, containing 26 teeth on its circumference, is known as 8 teeth to the inch through its diameter, the rest of them claiming that the correct way to determine the pitch is to measure on the pitch line from center to center of tooth, thus a tooth measures ⅜″ and $\frac{1}{8}''$, and they say it is 2½ pitch, which I claim is not correct. A. This question is fully explained in the SCIENTIFIC AMERICAN of January 19, 1878.

(31) J. M. C. writes: 1. I have an engine, 15 inch cylinder, 48 inches stroke, that has near the back port a frost crack about 3½ inches long, that when running with a heavy pressure of steam leaks very badly, and I am afraid will burst the cylinder. Can you tell me of any cement that will close the crack so that it will be steam tight? A. You can secure a patch with tap bolts, and either calk it or drive a rust joint. 2. I have also a Knowles No. 3 pump for supplying boilers. The pump is 230 feet from the pond. I have a clack valve about 6 inches from the strainer, and 8 feet above that I have an upright check valve that hammers very bad when the pump is run any faster than 28 strokes per minute. Is it the length of pipe that makes it hammer so, or does the pump draw too hard? The pipe is 2½ inches. A. It is probably due to length of pipe, and if so, may be remedied by using a larger air vessel or an additional one.

(32) E. B. H. asks: Is there any way of preparing canvas for painting without the use of pumice stone to rub down, and can it be made smooth? A. Apply thick paint to sized canvas with a palette knife or spatula.

(33) G. W. M.—Iron may be very easily deposited from its sulphate; dissolve a little crystalline sulphate of iron in water and add a few drops of sulphuric acid; one pair of Smee's battery may be used to deposit the iron upon copper or brass. The metal in this pure state has a very bright and beautiful silver color.

(34) W. B. H. asks for the different threads used for different sizes of gas pipes, also the different diameters of pipe, both outside and inside. A.

Bore of	pipe	⅛	27	No. of threads per inch.		
"	"	¼	18	"	"	"
"	"	⅜	18	"	"	"
"	"	½	14	"	"	"
"	"	¾	14	"	"	"
"	"	1	11½	"	"	"
"	"	1¼	11½	"	"	"
"	"	1½	11½	"	"	"
"	"	2	11½	"	"	"
"	"	2½	8	"	"	"
"	"	3	8	"	"	"
"	"	3½	8	"	"	"
"	"	4	8	"	"	"

The bore is the size by which the pipe is designated; the outside diameter varies.

(35) M. A. W. writes: In making a phonograph, what diameter should the diaphragm which records the vibrations be? How fast should the cylinder which carries the tinfoil revolve? What material should the diaphragm be made of? A. In No. 133 of the SCIENTIFIC AMERICAN SUPPLEMENT there are full directions for making a phonograph.

(36) G. D. writes: 1. I have had some type nickel faced, and the nickel on some of it scales or peels off. How can this be guarded against? A. Use a perfectly uniform electrical current, make the zinc surface in the battery and the surface to be coated as nearly equal as possible. The surface of the nickel anode should never be less than the surface to be coated. If the type change their form under pressure, peeling cannot be avoided. 2. Is the recent French invention of toughened glass type a hoax? A. We do not know that they are in use.

(37) J. B. writes: I have a Smee battery with one cell. Can I nickelplate with it? and if so, please inform me how. A. Use a solution of chloride of nickel and ammonia made by dissolving 4 ozs. of the salt in 1 gallon of water.

The figures in parentheses in the SCIENTIFIC AMERICAN index refer to "Notes and Queries."

(38) W. writes: 1. I wish to transmit the power from a 25 horse power turbine to upright shaft 12 feet distant from water wheel shaft. How can it best be done? A. As the distance is quite short we would

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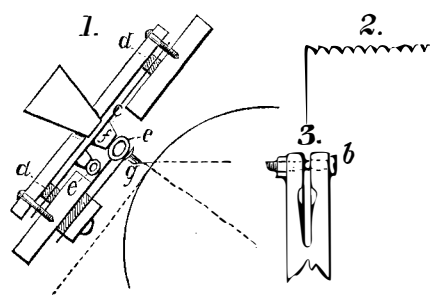
recommend a rubber or leather belt. 2. Are endless chain belts with suitable pulleys ever used for that purpose; and if so, how do they compare in efficiency and durability with spur or bevel gearing? A. Chains cannot be relied on for continued use.

(39) F. M. writes: The parts of my phonograph are made as follows: The hollow brass drum is 3 x 4½ inches, with ¾ inch steel spindle 16 inches long, costing at any brass foundry about $5 or $6. I have twenty threads to an inch on spindle, and same on drum, but not cut so deep. See Fig. 2. One of the



supports of spindle is sawed apart and drawn together by a bolt, *b*, causing the thread to cut its own way (nut) in the journal, as shown in Fig. 3. The base upon which the whole rests is 1 foot square and 3 inches thick, to give more hold to the uprights and stability to the whole. The disk, *c* (see Fig. 1), is made of leather colored press board, and is clamped between fruit jar rings, *d*, which are 2 inches in diameter. This disk must be renewed from time to time on account of its getting warped by the moisture of the voice. It gives much better results than the more substantial ferrotype. A very essential part is the proper dampening of disk by pieces of rubber tubing and small cubes of the same material. It is also of great importance to have the needle chisel-shaped, filed off at an angle of 45° to the tangent of the drum. The smallest darning needle is the best working. The reproducing funnel is 1½ foot long and 5 inches wide at the top and ⅛ inch at the bottom. It improves the sound if the hole for speaking in top lid is small, and also the space between disk and top lid is not to contain very much air.

Note.—Aside from the arrangement of the diaphragm and spindle support F. M.'s phonograph does not differ essentially from that described in the SCIENTIFIC AMERICAN SUPPLEMENT No. 133.—ED.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

F. & Co.—It is heavy spar—sulphate of baryta.—J. D., Jr.—Mica.—W. G. B.—No. 1 is natrolite—silica 47·2; alumina, 27·0; soda, 16·3; water, 9·5. No. 2 is pyroxene.—H. W.—The incrustation consists principally of lime carbonate, silica, alumina, silicate and iron oxide.—J. S. W.—It is a rich ore of lead—galena. It probably contains silver.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges with much pleasure the receipt of original papers and contributions on the following subjects:

Rosin in Beer. By N. D.
Magic Lantern. By G. S.
Tortoise. By S. E. C.
A Telephone. By G. F. S.
Beet Sugar. By E. T. G.
Imports and Exports, also change of Climate of Minnesota, Kansas, and Nebraska. By C. I.
Astronomy. By J. E. W.
Air Ships. By R. G.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

May 14, 1878,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city.

Air forcing apparatus, O. Millard 203,752
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From June 14 to June 18, 1878, inclusive.

Carbureting gas.—J. M. Palmer *et. al.*, Cambridge, Mass.
Carcoupler.—F. Gibford, Newton, Iowa.
Electro-metallurgy.—J. W. Tufts, Medford, Mass.
Furnace blowers.—Steam Blower Company, New York city.
Grain binders.—C. H. McCormick, Chicago, Ill.
Hats.—W. Wetzel, New York city.
Millstone dress.—E. Blythe, Rochester, N. Y.
Ruling machine.—W. O. Hickok, Harrisburg, Pa.
Sewing machines.—W. E. Doubleday, Brooklyn, N. Y.
Signal cartridges.—E. Very, United States Navy.
Telephones.—T. A. Edison, Menlo Park, N. J.
Winders for textile fabrics.—J. C. Lyon, New York city.

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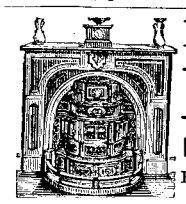

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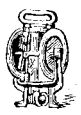

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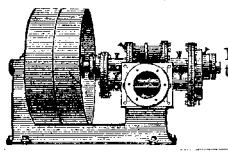

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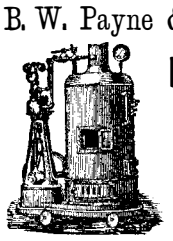

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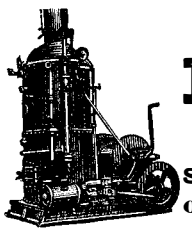

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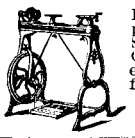

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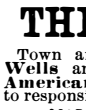

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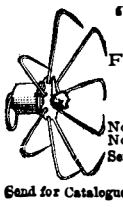

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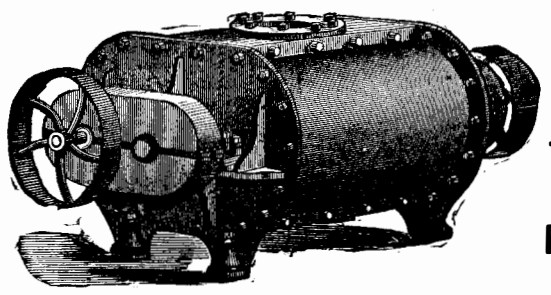

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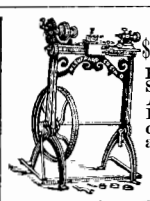

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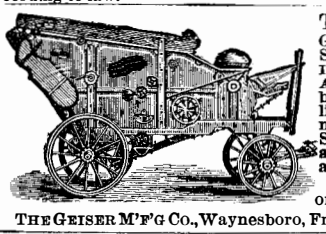

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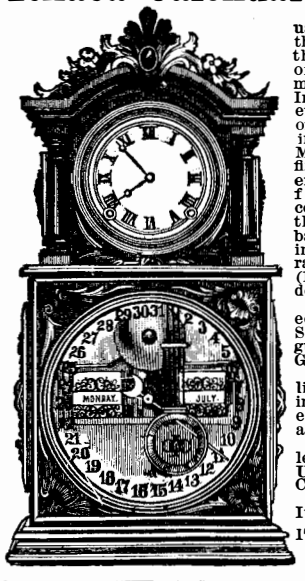

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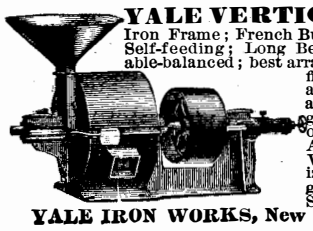

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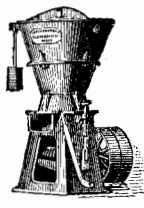

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